CD inside contains the latest User Manuals and firmware

VDL
SIEMENS S7-300
DATA LOGGER

USER MANUAL

MICRO-AIDE

Rail Signal Products

EVENT RECORDERS ALARM REPORTERS DATA LOGGERS
CLOCK SYNCHRONIZERS CURRENT SENSORS VOLTAGE MONITORS
BATTERY MONITORS LIGHT OUT DETECTORS CUSTOM ENGINEERING

MICRO-AIDE

www.micro-aide.com

RAIL SIGNAL PRODUCTS

VDL S7-300
DATA LOGGER
USER MANUAL

Revised: November 26, 2014

MICRO-AIDE CORPORATION Tel: 626-915-5502 Fax: 626-331-9484 E-mail: support@micro-aide.com
685 Arrow Grand Circle Covina, CA 91722

Copyright© 2008 by MICRO-AIDE Corporation

All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means without the written permission of MICRO-AIDE Corporation.

The information in this document is subject to change without notice. MICRO-AIDE believes the information contained in this document to be accurate. However, MICRO-AIDE assumes no responsibility for any errors or omissions.

Windows, Windows XP, Windows 7, Excel, Access, Notepad and Word are registered trademarks of Microsoft Corporation.

HyperTerminal is a registered trademark of Hilgraeve Inc.

Ethernet is a registered trademark of Xerox Corporation.

Table of Contents

Chapter 1 – General Description

Introduction . . . 1
Key Features. . . . 2
Comparing the VDL S7-300 and CWR-24E . . . 3
Firmware Modification History . . . 3
Setup Database Compatibility . . . 4
About this Manual. . . . 5

Chapter 2 – Installation

Introduction . . . 7
Unpacking. . . . 7
Initial Check-Out Procedure . . . 7
Installation Procedure. . . . 11
- Location . . . 11
- Mounting . . . 11
- Site Preparation . . . 11
- Peripheral Equipment . . . 12
  - USB Device Port . . . 12
  - Terminal Port. . . . 12
  - Vital-Processor Port . . . 12
  - Ethernet Port (optional) . . . 12
  - Internal Modem (optional) . . . 12
  - GPS Receiver (optional). . . . 12
- Cabling. . . . 13
  - Power . . . 13
  - Alarm Relay . . . 13
  - Input Circuits . . . 13
  - Connecting to the Siemens S7-300 . . . 13
- Applying Power . . . 13

Chapter 3 – Setup

Introduction . . . 15
Logging On . . . 15
User Interface Conventions . . . 15
- Fields and Commands . . . 15
  - Working with Fields . . . 16
  - Completing Commands. . . . 16
- Data Flow Control . . . 16

TC

Setup Procedure 17
Setup (S) 17
Time / Date (T) 17
Reset System (R) 18
System Parameters (S) 20
Analog Configuration (A) 24
Timer Inputs (W) 26
Event Names (E) 28
Input Names / Identifiers (I) 28
Virtual Inputs (V) 29
Network (N) 31
Print Setup Data (P) 33
Transfer Files (T) 33
Download Setup Data (D) - Saving the Database 34
Upload Setup Data (U) - Restoring the Database 35
Log Off (X) 36

Chapter 4 – Operation

Introduction 37
Multi-User Operation 37
Remote Operation 37
Establishing an Ethernet Connection 37
Establishing a Modem Connection 38
Logging On 38
How to Operate the VDL 38
Query Events (Q) 38
Selecting a Single Date 39
Selecting a Range of Dates 39
Query Report Menu 39
View Events (V) 42
Include Details 42
Inputs 42
Live Status (L) 42
Event Record Formatting 43
No Details 43
Include Details 44
Symbol Legend 45
CSV Report Type 45
CSV Sample Report 45
CSV Input Numbers 47
Capturing Event Records to a PC File 47

Chapter 5 – Front Panel Operation

Introduction 49
Front Panel Description 49
USB Host Port 49
Liquid Crystal Display 49
Keypad 49

LED Indicators 50
How to Use the USB Host Port 50
Saving Records to a Flash Drive 50
Saving Event Records from a Complete Day 50
Saving Event Records from a Range of Times and Dates. 51
Files Written to the Flash Drive 52
Events Text File 52
Events Binary File 53
Setup Database Binary File 53
How to Use the Keypad 53
Idle Mode 53
Event Record Format 54
Browse Mode 55
Event Records 55
Input Status 56
Setup Mode 57
Alphanumeric Editing Procedure 59
Clock 59
TimZone 60
CSMode 60
UName. 61
ENames 61
INames 62
Analog. 62
Virtual 63
Timer 65
TLimits 65
PCode 66
Modem 66
Baud 67
Diag 67
Update 70
RESET. 71

TC

CHAPTER 6 – MAINTENANCE

Introduction 73
Adjusting the LCD Contrast 73
Working Inside the Data Logger 73
Replacing the Fuses 74
Installing the Optional GPS Receiver 74
Installing the Optional Modem. 74
Installing the Optional Ethernet Port 75
Reconnecting the Internal Cables. 76
Diagnostic Testing. 76
Checksum Test Program Memory (C) 76
Flash Memory Test (F) 77
GPS Receiver Test (G) 77

Ethernet Test (E) 78
Modem Test (M) 78
Keypad Test (K) 78
Relay Test (R) 78
Temperature (T) 79
System Events 79
Updating the Firmware 80
Trouble-Shooting Guide 82

Appendix A – Technical Data

Specifications 85
Transfer Rates 87
Terminal Port Cable 87

Appendix B – Options and Accessories

Options 89
Accessories 89

Appendix C – USB Device Drivers

Introduction 91
Preparation 91
Installing the Drivers 91
Windows XP Procedure 91
Windows 7 Procedure 94
Making a USB Device Port Connection 96

TC

Chapter 1 – General Description

Introduction

Since 1988 MICRO-AIDE has provided the rail signal industry with a broad range of event recording devices and systems that vary in capacity, size and features. Our considerable expertise in this field has also been used to create a highly innovative product referred to as a Vital-Processor Data Logger (i.e., VDL). The VDL is unique in its ability to gather and report event data by communicating directly with a Programmable Logic Controller (PLC). The VDL does not require wired attachments to spare vital and/or non-vital relay points in order to report Digital Input events. Considerable material and labor-related expense can be avoided by using the VDL in place of a standalone Event Recorder. Additionally, a user interested in gathering incident or maintenance data will no longer need to log onto the PLC. Instead, critical data can be acquired by accessing the VDL which operates strictly as a passive, non-vital monitoring device.

The VDL can be used with an Ansaldo Microlok II and Siemens S7-300 controller. The installed firmware determines which PLC will be monitored. The hardware used by both versions is identical.

This User Manual describes the Siemens S7-300 version of the VDL. The current version of the Microlok II and S7-300 firmware are available for free downloading from the following web page: www.micro-aide.com/support/downloads.htm. To be used with a VDL, the Siemens S7-300 must be equipped with the CP 340 Communications Processor option.

Like many devices, the VDL utilizes an internal real-time clock for date and time stamping events. Historically, these real-time clocks have been susceptible to drift. Over the course of several months the accumulated drift can exceed several minutes. This factor can greatly complicate incident investigation and reporting. However, the VDL eliminates the problems introduced by clock inaccuracy once and for all. The GPS Receiver option utilizes GPS technology to set the time and date. Alternatively, the Ethernet® Port option allows the Data Logger to communicate with a LAN-based time server. Time servers broadcast time and date information using the SNTP protocol. The VDL is designed to support Unicast and Multicast SNTP messaging. Any of these three methods provide for time stamping that is 100% accurate and drift-free without the need for any user intervention.

As a convenience to its user, the VDL can copy Event Records directly to a FAT-32 formatted flash drive. The USB Host Port is a standard feature of the Data Logger. Install a flash drive into the unit's front panel socket, press a few keypad buttons and in seconds Event Records from any time span are written as a .txt file. The .txt file can then be read, e-mailed or printed as required.

Every VDL comes equipped with a built-in keypad and display screen located on the front panel. This allows the user to effectively operate the Data Logger without additional peripheral devices. However, each logger will support applications that require PC-based storage of Event Records. The logger is equipped with USB and serial Terminal Ports. It can also be equipped with an optional Ethernet Port. Collectively they provide for increased flexibility when interfacing with the logger. The USB Device and Ethernet Ports provide high speed data transfer rates of 960 Kbps and 850 Kbps, respectively. A PC is then used to retrieve, store and review Event Record data of interest to the user.

An optional 33,600 Baud internal modem can also be installed. It too allows the user to remotely access and operate the Data Logger. A standard phone line connection allows the user to gather critical Event

Records from any location, however distant. The modem can also be used to provide dial-out alarm reporting to a maintenance facility.

The VDL is also equipped with four general purpose Analog Inputs. The Analog Inputs can be used to monitor both DC and AC voltages such as battery levels and commercial power voltages.

Eight Virtual Inputs allow the user to create Event Records based upon a specific logical association of several Digital, Analog, Timer and other Virtual Inputs. The Virtual Input feature can be very useful in analyzing failure conditions or in creating alarm indications. Tedious and confusing site-specific profiles are not required when using the Virtual Input feature.

Sixteen Timer Inputs can be used to measure and report the elapsed time between any two events. As an example, the duration of a bit transition, the time between two separate bit events or the occurrence of an Analog Input event and a bit event can be reported. Additionally, separate High and Low Limit Values can be assigned for each timer. An event occurrence that is too fast or slow when compared to the Limit Values is identified in a Timer Input Event Record.

All MICRO-AIDE rail signal products, including the VDL S7-300, are designed to be easy to use and maintain. Each design is based upon the premise that value and reliability start with attention to detail and a concern for usability rather than needless complexity. Our goal in creating the VDL was to provide the rail signal industry with an instrument maintainers and signal technicians will find easy to operate long after the Data Logger has been installed and set up.

Key Features

Listed in the following are some of the features included with every VDL S7-300.

- A serial comm connection to the S7-300 is used to report events from 999 Digital Inputs.
- No external wiring of Digital Inputs is required.
- Security is improved, as event data is available directly from the VDL without having to log onto the PLC.
- The USB Host Port allows copying of Event Records to a FAT-32 formatted flash drive.
- The 960 Kbps USB Device Port can be used in lieu of the serial Terminal Port.
- The optional GPS Receiver allows the logger's real-time clock to operate 100% accurately without any user intervention.
- The optional internal Ethernet Port allows for remote LAN-based access via a Telnet connection.
- If the LAN includes a time server, the optional Ethernet Port also allows the logger's real-time clock to be precisely controlled using SNTP. Unicast and Multicast protocols are supported.
- Automatic adjustment for Daylight Saving Time (DST) can be enabled or disabled. The DST feature is in full compliance with the Energy Policy Act of 2005 which took effect in 2007.
- The time zone setting of the logger can be assigned to any of seven zones used in North America.
- The storage capacity is 284,785 Event Records (expandable to 1,182,769).
- Event Records can be logged for 128 distinct days.
- Event Records are stored in flash memory devices that do not require a battery power source. Records are retained even if power is removed.
- Setup data and Event Record data can be easily and quickly transferred to a PC file.
- Every Event Record includes a measurement for each of four Analog Inputs.
- Analog Inputs can range from 51.1 V (.1 V scale) to 255 V (1 V scale), DC or AC.

- Analog Inputs are tested against separate High and Low Limit Values that are assigned by the user. Crossing either Limit Value will create an Event Record.
- Events are date and time stamped to the nearest tenth of a second.
- Eight Virtual Inputs can be programmed to create Event Records that identify alarm or fault conditions of special interest to the user.
- Sixteen Timer Inputs can be used to measure and report intervals between any pair of events.
- Limit Values can be assigned to establish a range of acceptable and unacceptable timed intervals.
- Timer Inputs create Event Records that list the timed interval and its relationship to the programmed Limit Values.
- Installation is quite simple. Input wires are terminated in detachable, tension clamp terminals. Wire sizes as large as 12 AWG can be used.
- Maximum power consumption is less than 4 W. A 9 to 36 Vdc power source can be used to power the logger.
- The internal temperature of the logger is measured and reported.
- The user interface provides full cursor control when using a PC.
- Three distinct levels of password security provide protection against unauthorized access.
- Several diagnostic commands can be executed to verify important system operations.
- Firmware updates can be uploaded to the logger via any port (i.e., Terminal, modem, USB Device or Ethernet). Additionally, new firmware can be uploaded directly via a USB flash drive.
- MICRO-AIDE's GEA (Graphical Event Analyzer) software is fully compatible with the VDL S7-300. GEA can be used to poll, save, review, plot and analyze Event Record data.

COMPARING THE VDL S7-300 AND CWR-24E

Most of the recording features of the CWR-24E Event Recorder have been included as capabilities of the VDL S7-300. The hardware design of the VDL is a specific configuration of the CWR-24E. Nevertheless, there are several important distinctions. They have been highlighted in Table 1 on page 3.

Feature	VDL S7-300	CWR-24E
Digital Inputs	999, via PLC	20, hard wired
RS-232 Ports	Terminal and PLC Serial Port	Terminal Port only
Event Record time stamps	.1 sec.	.001 sec.
Flashing Events	not available	available
Flash Rate Reporting	not available	available
Train Speed Monitors	not available	4 available
Std. Event Record capacity	284,785	307,123

Table 1: VDL S7-300 and CWR-24E Differences

FIRMWARE MODIFICATION HISTORY

Features have either been introduced or modified as the result of the following firmware modifications.

V1.00 Initial release.

V1.01 A phone line disconnect is performed automatically if the Data Logger does not transmit any data for five minutes.

V1.02 Corrected time information associated with Event Records written to USB Host port.

V1.03 A potential issue involving the Query feature and evaluation of Virtual Inputs occurring at very high rates was resolved.

V1.04 Corrected LCD message displayed prior to initialization.

V1.05 The Administrative Password and Passcode are no longer listed in the Print Setup Data command during a Restricted Access session.

V1.06 The behavior of the Ethernet Port empty condition was modified.

V1.07 Corrected writing of Date and Image Records at the start of a new flash memory block.

V1.08 Added one wait state to all SRAM accesses. Must be used with boot loader version 1.01.

V1.09 Any time and date interval can now be selected when saving Event Records to a USB flash drive. The USB Host Port can now be used to upload new firmware directly from a flash drive.

V1.10 The Digital Input capacity was expanded from 256 to 999.

V1.10 retains compatibility with 256 input installations, however VDLs being updated from V1.0x to V1.10 and later must also have their Setup Databases updated. Failure to do so may result in erroneous Event Record data.

V1.11 Added support for SNTP-Unicast. Unicast message is sent at the completion of the initialization period and hourly thereafter.

V1.12 Query feature now works with non-contiguous dates in the date table. This fix also applies to GEA Query. Corrected problem with the Live Status of Virtual Inputs V5-8. Corrected Event Record problem with Analog Inputs A2-4.

V1.13 Added support for GEA V4.03.

1

SETUP DATABASE COMPATIBILITY

Occasionally, modifications to the firmware of the logger will result in a new memory map of the Setup Database. When this occurs the previously created Setup Database will be incompatible with the new firmware. Table 2 on page 5 details the compatibility status of each firmware version. A green check mark (☑)in any given row indicates compatibility with the previous Setup Database. A red X (☒)indicates that a new Setup Database will have to be created for the firmware version listed.

Firmware Version	Compatibility
V1.00	☑
V1.01	☑
V1.02	☑
V1.03	☑
V1.04	☑
V1.05	☑
V1.06	☑
V1.07	☑
V1.08	☑
V1.09	☑
V1.10	☒
V1.11	☑
V1.12	☑
V1.13	☑

Table 2: Setup Database Compatibility

When an incompatibility occurs, contact MICRO-AIDE before preparing a new Setup Database. E-mail a copy of the existing Setup Database along with the applicable firmware revision number. MICRO-AIDE will convert the database and return a file that is fully compatible with the new firmware version.

Never attempt to use an incompatible Setup Database. The operation of the logger can be severely impacted.

ABOUT THIS MANUAL

This document is intended to provide the user with comprehensive, easy-to-read instructions on how to install, set up, operate and maintain the MICRO-AIDE VDL S7-300. This document refers to Version 1.13 of the VDL S7-300 firmware. Specifically, the sample data and command details depicted were prepared using a Version 1.13 logger. Wherever possible, step-by-step instructions have been included. In the event the user has questions about any of the described procedures the user should contact MICRO-AIDE for assistance. Additional copies of this manual are available upon request.

MICRO-AIDE CORPORATION
685 Arrow Grand Circle
Covina, CA 91722
Tel: 626-915-5502 Fax: 626-331-9484
E-mail: support@micro-aide.com

The MICRO-AIDE "Material Return" and "Limited Warranty" policies can be found on the inside back cover of this manual.

The next chapter describes how to install the VDL.

User Notes

Chapter 2 – Installation

Introduction

This chapter describes how to properly unpack and install the VDL S7-300 prior to operation. It is advisable to perform the Initial Check-Out Procedure before attempting to set up the Data Logger.

Unpacking

Each VDL is packed in a shipping carton that is properly sized for the device. Abundant packing materials are provided to minimize mechanical shock to the contents. Before opening the carton inspect it for damage. Damage to the carton should be noted. Carefully remove the logger. It is advisable to save all packing materials in the event the unit ever needs to be returned to MICRO-AIDE.

Inspect the unit for visual damage. It should not be scratched, dented or deformed in any way. If it appears the logger was damaged in shipment the responsible carrier should be notified immediately. MICRO-AIDE will assist the user in filing a claim in the event damage was sustained during shipment.

Initial Check-Out Procedure

Before the VDL is installed at a signal facility it is recommended that an operational check of the logger be performed. The following materials are required as a part of this procedure.

- 12 Vdc power source.
- Common hook-up wire for power and testing inputs (12 to 22 AWG).
- Wire strippers and small, flat-head screwdriver.
- PC equipped with a communications program (e.g., HyperTerminal®) and either a USB port or serial comm port set to operate at 38,400 Baud.
- Digital Voltmeter (DVM).

Perform each step in the sequence listed in the following. If a problem arises, refer to the sections entitled "Diagnostic Testing" on page 76 and "Trouble-Shooting Guide" on page 82. Elements common to most installations are illustrated in Figure 1 on page 8 and Figure 2 on page 9.

1. With the power off, connect the power source positive and negative conductors to either pair of terminals labeled "B" and "N", respectively. They are located at the right end of the logger's top panel.
2. Connect the PC's serial comm port to the DE-9 male connector labeled "Terminal". Use the cable provided by MICRO-AIDE or a DE-9 to DE-9 straight-through cable. Figure 6 on page 87 illustrates the proper wiring of the cable. Alternatively, connect a USB A-B cable between the logger's port labeled "USB Device to PC" and any USB port available on the PC.

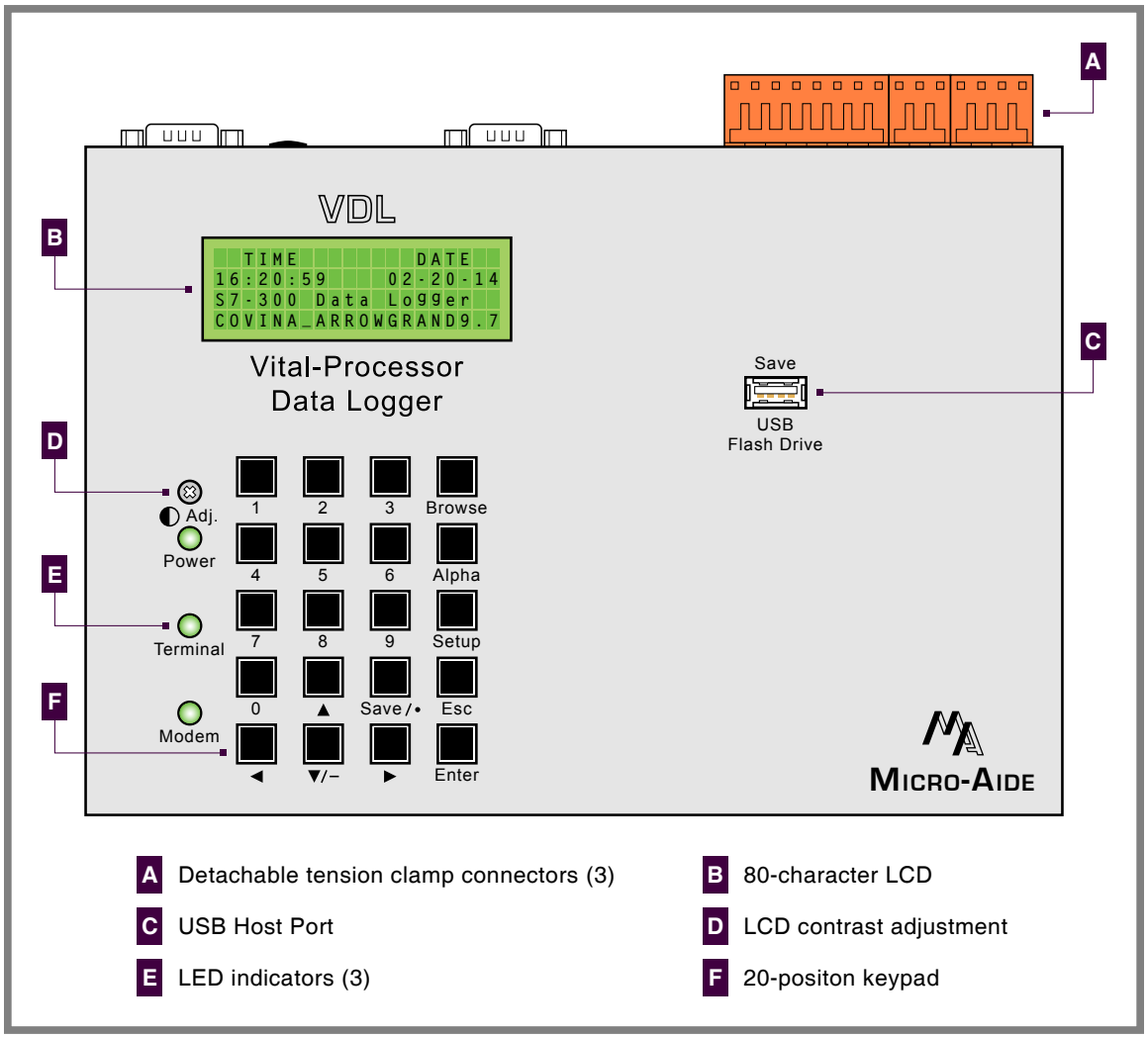


Figure 1: Typical Installation - Front Panel View

2

To use the logger's USB Device Port the proper drivers must be installed in the PC. Appendix C describes how to locate and install the correct drivers.

The factory default setting for the Terminal Port is 38,400 Baud. Refer to the procedure entitled "Terminal Port Baud Rate" on page 21 for details on changing the Baud rate. The VDL requires 8 data bits, no parity and 1 stop bit (i.e., 8-N-1).

3. Set the PC to emulate an ANSI terminal. In the case of HyperTerminal, click on the File, Properties command. Select the Settings tab. Enable Terminal keys. Select ANSI from the Emulation drop-down list box.

4. Apply power to the PC. Ensure that the communications program is set for a direct connection to the appropriate communications port.

5. Apply power to the VDL. The Liquid Crystal Display (LCD) panel should illuminate. The PC will display the following message (Terminal Port).

```
Micro-Aide CWR-24E Flash Boot Loader 1.01
Press ESC for boot loader
```

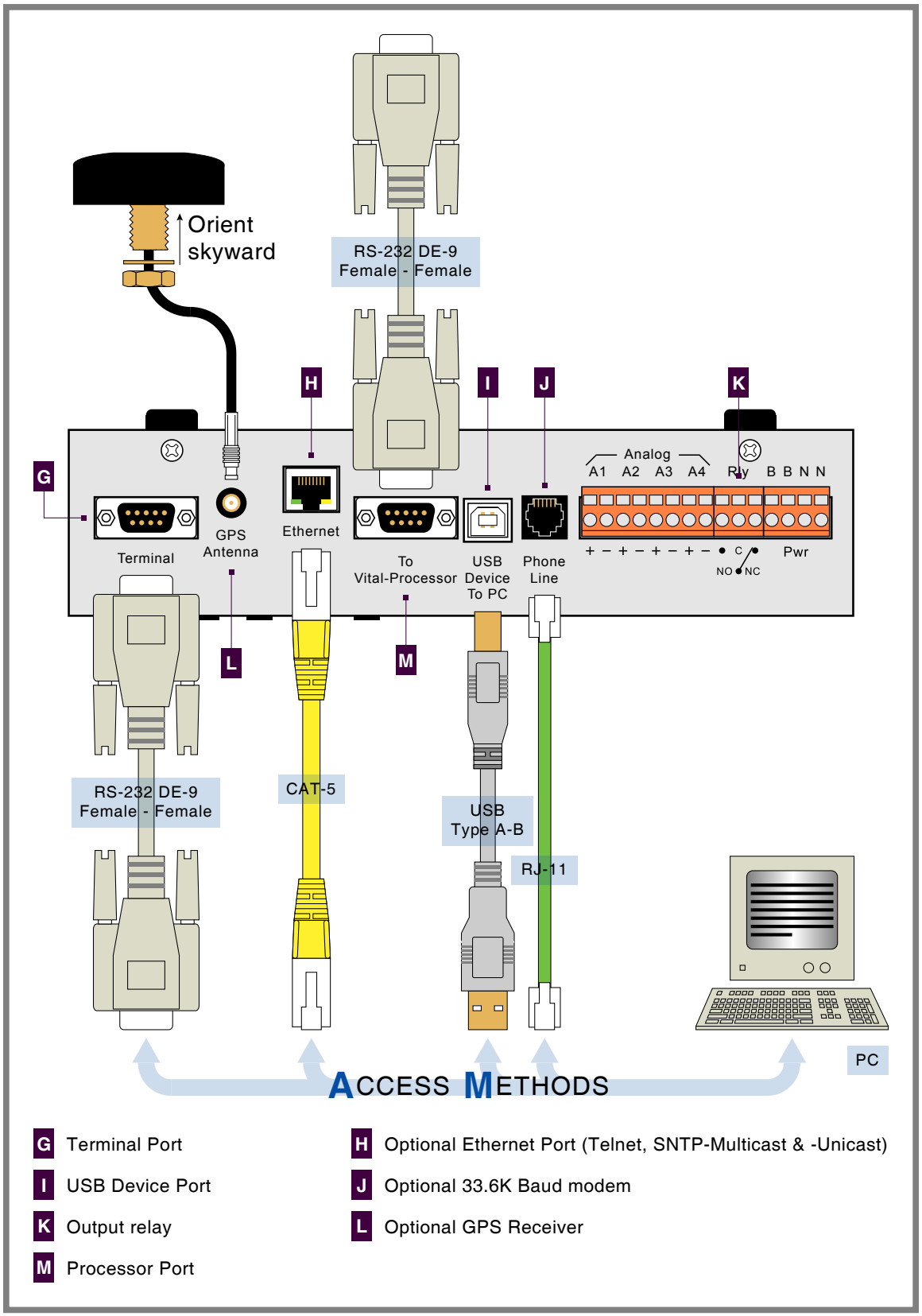


Figure 2: Typical Installation - Top Panel View

The preceding message should be ignored. Do not press the **Esc** key. The user must wait several seconds for the VDL to complete its initialization process.

6. After the logger completes its initialization the date and time should appear on the LCD. The date and time may need to be changed. The procedure for changing the date and time is described in the section entitled "Time / Date (T)" on page 17. The following password challenge will be displayed.

```
Siemens S7-300 Data Logger. Ver 1.13 (C) 2011 MICRO-AIDE INC.

***** NOT SET *****

Event storage capacity: 284785

Enter password:
```

Password Request

7. If the logger fails to display the password request, check the power and peripheral connections and Baud rate and communications settings. If the problem can be isolated to the VDL contact MICRO-AIDE customer service for instructions on how to proceed.

Repair and return policies are described on the inside back cover of this manual.

8. The remainder of the Initial Check-Out Procedure presumes the logger is configured to operate with the factory default settings and Event Records have not been logged into memory. If this is not the case the user may wish to reset the unit. Refer to the section entitled "Reset System (R)" on page 18 for details.

9. From the PC's keyboard type **PASSWORD** in upper-case letters. This is the default password. Complete the entry by pressing the **Enter** key. The Main Menu, shown in the following, will be displayed.

```
                MICRO-AIDE Vital-Processor Data Logger

                          S Setup
                          L Live Status
                          Q Query Events
                          V View Events
                          T Transfer Files
                          D Diagnostics
                          X Log Off
```

Main Menu

10. Press the **L** key. The VDL will now display the real-time status of Digital and Analog Inputs.

11. Connect the 12Vdc positive and negative test leads to the two inputs of Analog Input A1.

12. Verify the Analog Input reading for A1 is within .15Vdc of the correct reading. The correct polarity of the applied voltage should also be indicated.

13. Repeat the previous two steps for the remaining three Analog Inputs.

14. Press the **Esc** key once to return to the Main Menu. Perform a Query of the Event Records by pressing **Q** at the PC keyboard. Select today's date and then press **Enter**. Finally, press the **F1** function key. Refer to the section entitled "Query Events (Q)" on page 38 for additional details.

15. Verify that a Power On Event Record is reported listing today's date.

16. Before completing the Initial Check-Out Procedure verify the LCD is providing acceptable contrast. If it needs to be improved adjust the potentiometer located at the logger's front panel. Refer to the section entitled "Adjusting the LCD Contrast" on page 73.

This concludes the Initial Check-Out Procedure. This procedure may be used at any time to verify that the VDL is operating properly. Power can now be removed from the logger. Connections to the PC should also be removed.

In the event that a failure occurs during any part of this procedure a series of diagnostic tests should be performed. Refer to the sections entitled "Diagnostic Testing" on page 76 and "Trouble-Shooting Guide" on page 82. Alternatively, the user may wish to contact MICRO-AIDE customer service. Instructions on how to proceed will be offered. "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

INSTALLATION PROCEDURE

The following sections describe the recommended Installation Procedure. Figure 1 on page 8 and Figure 2 on page 9 illustrate elements that are common to most installations. The illustrations also depict the location of each connector used in the installation.

LOCATION

The location where the VDL is to be installed should comply with a few simple requirements. The ambient temperature near the logger should be in the range from -40°C to 72°C.

MOUNTING

The VDL can be mounted on top of a suitable shelf or secured to a back board. Each logger is equipped with non-slip, rubber feet. Precautions should, however, be taken to prevent the unit from dropping off the edge of the shelf or desktop. The shelf mounting brackets provided with the unit can be used for this purpose. To attach the shelf mounting brackets remove the four rubber feet. The provided screws and threaded holes vacated by the rubber feet are used to install the brackets. If a PC is to be used it must be properly secured.

Contact MICRO-AIDE in the event 19" rack mounting brackets are required. Refer to the section entitled "Accessories" on page 89 for ordering details.

SITE PREPARATION

The equipment location must have access to a stable 9 to 36 Vdc power source. A pair of wires must be run from the power source to the location where the logger will be mounted. The VDL wire ends must be stripped approximately 1/4". The stripped ends will be secured by tension clamp terminals located along the top panel of the unit. One wire must be connected to the positive voltage of the power source and the other wire must be attached to the return of the power source. The tension clamp terminals will accept wire sizes as large as 12 AWG. The two wires must be properly secured to prevent damage. It is preferable not to run the wires adjacent to electrical equipment such as motors that may generate large electrical disturbances.

The serial comm port labeled "To Vital-Processor" must be connected to the CP 340 Communication Port of the Siemens S7-300. Use the cable provided by MICRO-AIDE or a DE-9 to DE-9 straight-through cable. Figure 6 on page 87 illustrates the proper wiring of the cable. The VDL must be mounted within six cable feet of the vital-processor.

The Analog Inputs also use a tension clamp style of detachable connector. Each wire should be tagged with its circuit identity. Each input cable or wire bundle should be secured to prevent damage to the connections at either end.

The VDL can be programmed to issue an alarm indication signal. A form C relay with normally closed and normally open contacts is available at the connector alongside where power is attached to the logger. The contacts are rated for 2 Adc at 24 Vdc and 1 Aac at 125 Vac. The relay can be used to control an external light or warning device.

The GPS Receiver option utilizes an external antenna. The bulkhead-style antenna is designed to be mounted outdoors on any surface less than 3/8" in thickness. It requires a 1/2" diameter hole to be drilled through the mounting surface. The hole should be properly sealed. The antenna assembly also includes a washer, nut and 16' cable.

PERIPHERAL EQUIPMENT

If a PC is to be co-located with the VDL an appropriate AC power source must be available. Additional connections can be made as described in the following sections.

USB DEVICE PORT

If an on-site PC is to be used MICRO-AIDE recommends that the USB Device Port be connected to a USB port of the PC. The USB Device Port will support data transfer rates of 960Kbps. A standard USB Type A-B cable is used for this purpose. Table 14 on page 87 lists the bit transfer rates of each user-accessible port.

To use the logger's USB Device Port the proper drivers must be installed in the PC. Appendix C describes how to locate and install the correct drivers.

TERMINAL PORT

As an alternative, the PC can be connected to the Terminal Port. The Terminal Port cable should be kept to a minimum distance, preferably less than 20'. MICRO-AIDE provides, as a standard feature, an RS-232 DE-9 to DE-9 cable. The cable is suitable for use with any PC comm port or USB-to-serial adapter cable.

Each logger is shipped with a pair of MICRO-AIDE manufactured RS-232 cables. Both cables are wired identically and can be used interchangeably with the Terminal and Vital-Processor Ports. The shield wire in each cable is not attached. Consequently, the logger chassis and peripheral device are electrically isolated. This further improves the isolation properties of the system.

VITAL-PROCESSOR PORT

The VDL logs Event Records for Digital Inputs by establishing a communications connection with the Siemens S7-300. Accordingly, the VDL port labeled "To Vital-Processor" must be connected to the CP 340 Communications Port.

ETHERNET PORT (OPTIONAL)

The optional Ethernet Port may be used to connect the VDL to a LAN or PC. A standard CAT-5 Ethernet cable is used to connect to the LAN via a hub or switch. The length of either cable must be limited to 50'. Table 14 on page 87 lists the bit transfer rates of each user-accessible port.

INTERNAL MODEM (OPTIONAL)

If the VDL is equipped with the optional internal modem, a standard telephone line can be attached to the logger. The telephone line must be terminated with an RJ-11 connector like those commonly used in residential telephone service. Test the telephone line first to ensure that a dial tone is available.

GPS RECEIVER (OPTIONAL)

The GPS Receiver option is the preferred means of precisely controlling the logger's real-time clock. The optional feature includes a bulkhead-mount antenna designed specifically for use with the receiver module. For improved reception the antenna should be mounted outside of the equipment house or cabinet, as it requires unobstructed skyward access. The antenna is designed to be moisture proof and is rated to operate over a broad temperature range.

The antenna is equipped with a 16' coaxial cable. The antenna end of the cable is non-detachable. The other end of the cable terminates in an MCX-male connector. The MCX connector must be secured to the logger's connector labeled "GPS Antenna" located along the top panel.

Upon request, an optional magnetic-mount antenna can be supplied. Refer to the section entitled "Options" on page 89 for additional details.

CABLING

Follow the steps listed in the following to complete the cabling installation.

The power, alarm relay and input wires all terminate in connectors that are detachable. The cable installation may be performed more easily if the female connectors are first detached from their male halves that remain secured to the VDL circuit board.

POWER

1. Ensure that the power is off at the power source.
2. The two wires from the power source must be secured to either pair of tension clamp terminals labeled "B" and "N", respectively.
3. Connect AC power to the PC (as required).

ALARM RELAY

Wire the alarm indicating device or circuit to the appropriate relay terminals labeled "C", "NO" or "NC" (i.e., common, normally open, normally closed, respectively).

INPUT CIRCUITS

Events will only be recorded if the input circuits are wired properly to the VDL. The correct polarity of Analog Inputs must be identified. The four Analog Inputs terminate in a separate connector located at the top panel of the logger. They are labeled as inputs "A1" through "A4".

Event Records will indicate positive and negative polarities for each Analog Input.

The user may wish to verify the proper operation of each input. The "Initial Check-Out Procedure" on page 7 should be used to identify any faulty input wiring.

CONNECTING TO THE SIEMENS S7-300

Use the cable provided to connect the VDL to the CP 340 Communications Port of the vital-processor. Once power is applied to the VDL it will complete its initialization sequence and shortly thereafter automatically establish a connection with the S7-300.

APPLYING POWER

Once the cabling is installed the power can be applied. Shortly after power is applied the PC will display the password request. Refer to the sample data entitled "Password Request" on page 10. After the initialization sequence is completed the front panel LCD will indicate the time and date.

This completes the VDL Installation Procedure. The Setup Procedure can now be started. This is the subject of the next chapter.

User Notes

Chapter 3 – Setup

Introduction

This chapter describes how to set up the VDL S7-300 for use in a typical application. It is assumed that the Setup Database contains the factory default settings.

Logging On

User sessions are initiated only after the log-on procedure is completed. Logging on is described in the section entitled "Initial Check-Out Procedure" on page 7. To log on the user must enter the correct password in response to the password challenge. A typical password challenge message is shown in the sample data entitled "Password Request" on page 10.

The Terminal, USB Device and optional Ethernet and modem ports of the VDL incorporate two levels of password security. Each level uses a distinct password. The Restricted Access password allows a user to review all aspects of the Setup Database. Modifications to the Setup Database are limited to parameters that are considered site-specific. The Administrative Access password allows a user full access to all aspects of the Data Logger. This includes the unrestricted ability to make changes to the Setup Database.

The factory default password is **PASSWORD** in upper-case letters.

The Main Menu, as shown below, will be displayed after the correct password has been entered.

```
MICRO-AIDE Vital-Processor Data Logger

S Setup
L Live Status
Q Query Events
V View Events
T Transfer Files
D Diagnostics
X Log Off
```

Main Menu

User Interface Conventions

The VDL user interface is designed for ease-of-use. Before proceeding further, the user should become familiar with a few simple aspects of the interface.

Fields and Commands

The VDL user interface allows commands and parameter fields to be easily and quickly selected. Commands are listed vertically in a menu. Some commands direct the user to sub-menus containing additional commands (e.g., Setup command). Fields allow the user to either select or enter parameter values. A specific field is always uniquely associated with a particular command.

To select a command from a menu or a field within a command simply move the rectangular highlight to the location of the desired command or field. Pressing the appropriate arrow keys located on the PC keyboard will move the highlight. The left, right, up and down arrow keys may be used in any sequence to position the highlight.

To execute a command that has been previously selected (i.e., highlighted) simply press the **Enter** key. Alternatively, the command may be executed by pressing the single-letter code listed to the left of the command. Upper- and lower-case letters may be used. Every command listed in a menu has a distinct single-letter code that permits immediate execution of that command.

WORKING WITH FIELDS

The VDL utilizes two types of fields. Selection Fields allow the user to select a parameter from a list of pre-defined values (e.g., Terminal Port Baud Rate). Edit Fields can be set to any alphanumeric value desired by the user (e.g., Unit Name).

To change the value of a Selection Field simply press the **Spacebar** on the PC keyboard. The next value from a predefined list of values will be displayed each time the **Spacebar** is pressed. The first value in the list will automatically follow the last value.

Input Names and Limit Values are examples of parameters that are defined by Edit Fields. After the desired Edit Field is highlighted the user may type any combination of alphanumeric characters appropriate to the field. The initial value of the field is completely removed after typing the first character. Consequently, it is not necessary to delete each character that comprises the initial value. Errors in typing can be corrected by using the **Backspace** key. At any time while editing a field the user may press the **Esc** key and thereby restore the field to its previous value.

Upper- and lower-case letters may be used. Limit Values are assigned negative values by preceding the numeric entry with a minus sign. Numeric values that exceed the range of the field are automatically set to the maximum or minimum value (as appropriate) permitted by the range.

To accept the new value assigned to an Edit Field the user can either press the **Enter** key or move the highlight to a new field. The initial value of an Edit Field cannot be restored after the new value has been accepted. When all of the fields contain values suitable to the user the command may be completed.

Once a field has been accepted by pressing the **Enter** key or moving the highlight it may, depending upon the command, be programmed into the logger as an updated operating parameter. Accordingly, the acceptance may occur before completion of the command.

COMPLETING COMMANDS

Generally, commands are completed by pressing the **Esc** key. However, pressing the **Esc** key will not complete the command if the user is in the process of editing a field. Pressing the **Esc** key prior to accepting the new value will instead restore the highlighted field to its previous value. To complete a command that requires pressing the **Esc** key, first accept the contents of the last Edit Field by pressing the **Enter** key or moving the highlight to another field.

Some commands are completed by responding to a choice listed in a Selection Field (e.g., No or Yes). In these cases the command is completed by highlighting the desired choice and then pressing the **Enter** key. Pressing the **Esc** key is the equivalent of selecting the default choice (generally the No option). As a rule of thumb, executing the No option will abandon any field changes made prior to the completion.

Other commands are completed by pressing the key described in a prompt message displayed with the command. Prompts are frequently listed with commands as an aid to the user. After the command is completed the user will be returned to the menu that was previously displayed.

DATA FLOW CONTROL

A few of the setup and operational commands can generate considerable amounts of displayed data. If the user wishes to observe this data on the screen of a PC it may be helpful to temporarily pause the data stream being sent by the logger. The Pause and Resume commands may be used to provide the required data flow control.

To Pause the data being sent press the **Ctrl** and **S** keys simultaneously. The data flow will be stopped indefinitely. To Resume data flow press the **Ctrl** and **Q** keys simultaneously. This technique can be used to freeze the data at the PC.

Another useful command is the Abort command. At any time during a lengthy data dump the remaining data can be ignored or aborted by pressing the **Esc** key. The user can then issue another command immediately after the Abort is executed rather than wait until the lengthy data dump is completed.

SETUP PROCEDURE

Before the VDL is ready for use the logger must be configured to reflect the operation required by the user. The following steps should be performed in the sequence listed. It is assumed that the user intends to access the VDL via a PC which is connected to either the USB Device or Terminal Port. Succeeding chapters describe how to use the front panel display and keypad, as well as access the logger via the optional Ethernet Port and internal modem. It is further assumed that the user has not previously altered any of the factory default settings.

The Terminal Port default settings are 38,400 Baud, 8 data bits, no parity and 1 stop bit (i.e., 8-N-1).

The Main Menu of commands will be displayed immediately after logging on. Refer to the sample data entitled "Main Menu" on page 15. The Setup Procedure described in this chapter will familiarize the user with the Setup, Transfer Files and Log Off commands listed in the Main Menu.

For the remainder of this chapter the Setup, Transfer Files, Log Off commands and their numerous sub-commands will be described in the sequence recommended by MICRO-AIDE for their execution as part of the Setup Procedure. Each command will be identified by its name as listed in the menu where it resides. The single-letter code that executes the command will be listed in parenthesis. The Setup Procedure commences with the execution of the Setup command listed at the top of the Main Menu.

The VDL does not require any programming or configuration setup to operate with the S7-300. Their operation with each other occurs automatically. The default port settings at either end of the communication link are preset to 9600 Baud, 8 data bits, no parity, 1 stop bit (i.e., 8-N-1). These settings should not be changed.

SETUP (S)

The following menu of sub-commands will be displayed after executing the Setup command.

```
                    Setup Menu

                T Time/Date
                E Event Names
                I Input Names/Identifiers
                A Analog Configuration
                V Virtual Inputs
                W Timer Inputs
                N Network
                S System Parameters
                P Print Setup Data
                R Reset System
```

Setup Commands

TIME / DATE (T)

The VDL time stamps all Event Records. Therefore, the correct time and date must be set. The logger will automatically account for leap year. The logger's clock circuitry will continue to keep time even if power is interrupted for a prolonged period.

To manually change the time or date execute the Time / Date command. The sample data listed in the following shows a typical response to the Time / Date command.

```
                    Time/Date

                         HH:MM:SS
                    Time: 16:20:59

                         MM-DD-YY
                    Date: 02-20-14 Thursday
```

Time / Date Command

The highlight may be moved to the hour, minute or second time fields or month, day or year date fields. The VDL utilizes a military-style clock. Accordingly, 12:01:02 AM is defined as 00:01:02 and 12:59:58 PM is defined as 23:59:58. Leading zeros are not required. The day of week is displayed automatically as determined by the date selected by the user.

To complete the command press the **Esc** key. The user can then accept or abandon the changes.

The clock of the VDL can be precisely controlled by three different means. The Clock Sync Mode can be set to GPS or SNTP. Either of two SNTP methods are available. Refer to the section entitled "Clock Sync Mode" on page 22. If the clock cannot be synchronized MICRO-AIDE recommends that the clock be manually set once per month.

Reset System (R)

The Reset System command can be used at any time to restore the logger to its factory default settings. The command can also be used to clear previously logged Event Records. This step is listed as part of the Setup Procedure since it can be useful in restoring the logger to a known state consistent with this documentation. Additionally, any programming or Event Records created as a part of the Initial Check-Out Procedure will be erased.

The following menu will be displayed after executing the Reset System command. Both command options are described in the sections that follow.

```
                    Reset System

                  S Reset Setup Data
                  E Reset Event Memory
                  B Reset Both
```

Reset System Command

The time and date settings, along with the Network and several System Parameters, are not affected by either option of the Reset System command.

Reset Setup Data (S)

The VDL utilizes two non-volatile memories. The first, referred to as the Setup Database, contains all of the programmed parameters established by the user. Most of these parameters can be restored to their factory default values by executing the Reset Setup Data command. Table 3 on page 18 lists the values after the reset is performed. Some parameters are unchanged by the reset.

Parameter	Default or Reset Value
Time / Date	(as previously assigned)
Event Names - On	On (1 - 19), Violate (20)
Event Names - Off	Off (1 - 19), Nominal (20)
Input Names - Digital Inputs	Digital Input 001, Digital Input 002, etc.
Input Names - Analog Inputs	Analog Input 01, Analog Input 02, etc.
Input Names - Virtual Inputs	Virtual Input 01, Virtual Input 02, etc.
Input Names - Timer Inputs	Timer 01, Timer 02, etc.

Table 3: Factory Default / Reset Settings

Parameter	Default or Reset Value
Identifiers - Digital Inputs	DInpu001, DInpu002, etc.
Identifiers - Analog Inputs	AInput01, AInput02, etc.
Identifiers - Virtual Inputs	VInput01, VInput02, etc.
Identifiers - Timer Inputs	Timer01, Timer02, etc.
Event Pairs	1, 20 for Timer Inputs
Analog Configuration - Range	±25.5 Vdc
Analog Configuration - Filter	Slow
Analog Configuration - Low Limit	-25.6 Vdc
Analog Configuration - High Limit	25.5 Vdc
Virtual Inputs - Variables	--- (not assigned)
Virtual Inputs - Relay	No
Virtual Inputs - Dial Out	No
Timer Inputs - From and To Triggers	--- (not assigned)
Timer Inputs - From and To Events	Off
Timer Inputs - LowLimit	0.0 seconds
Timer Inputs - HighLimit	0.0 seconds
Network - IP Address	(as previously assigned)
Network - Subnet Mask	(as previously assigned)
Network - Gateway	(as previously assigned)
Network - Ethernet MAC Address	(as previously assigned)
Network - Port	(as previously assigned)
Network - TCP / IP mode	(as previously assigned)
Unit Name	***** NOT SET *****
Terminal Port Baud Rate	38,400
V-P Port Baud Rate	9600
Administrative Password	PASSWORD
Restricted Password	LOOKWORD
Passcode	12345678
Ring Count	2
Primary Dial Number	(not assigned)
Secondary Dial Number	(not assigned)
Clock Sync Mode	(as previously assigned)
SNTP Server	0.0.0.0
Time Zone	(as previously assigned)
Daylight Saving Time	(as previously assigned)
High Temp Limit	257 °F
Low Temp Limit	-67 °F

Table 3: Factory Default / Reset Settings

The following precaution will be displayed after selecting the Reset Setup Data command.

```
RESET ALL SETUP DATA TO FACTORY DEFAULTS, ARE YOU SURE?
No Yes
```

Select No to abort the reset. Select Yes to proceed.

The Reset Setup Data command will return the Terminal Port Baud rate to its default settings of 38,400 Baud. The PC Baud rate may have to be adjusted.

RESET EVENT MEMORY (E)

The Reset Event Memory command will permanently remove from memory all Event Records that were previously logged. Records from each of 128 possible days will be deleted.

The following precaution will be displayed after selecting the Reset Event Memory command.

```
ERASE ALL EVENTS FROM MEMORY, ARE YOU SURE?
No Yes
```

Select No to abort the reset or Yes to proceed. If a reset is performed the following precaution will be displayed.

```
Erasing memory, do not turn power off for 60 seconds,
Press any key to continue
```

It is important that the user not turn off the power while the VDL is clearing the Event Record memory. Failure to do so may result in corruption to the Event Record set.

RESET BOTH (B)

The Reset Both command allows the user to clear both databases simultaneously. The precaution noted in the preceding paragraph applies to this command as well.

SYSTEM PARAMETERS (S)

System Parameters are those parameters that affect the logger as a whole. They do not affect individual inputs or their behavior. System Parameters include, but are not limited to, the Unit Name, passwords and modem options. The fourteen System Parameters are defined with a single command containing multiple fields. A typical response to the System Parameters command is shown in the following. The use of each System Parameter is described in the following sections.


```
                          System Parameters
                          -----------------
              Unit Name
***** NOT SET *****
              Terminal Port Baud Rate  38400
              V-P Port Baud Rate        9600
              Administrative Password PASSWORD
              Restricted Password     LOOKWORD
              Passcode                12345678
              Ring Count               2
              Primary Dial Number
              Secondary Dial Number
              Clock Sync Mode         None
              SNTP Server               0.  0.  0.  0
              Time Zone               PST  (UTC-8)
              Daylight Saving Time    Enabled
              High Temp Limit         257 Degrees F
              Low Temp Limit          -67 Degrees F
```

System Parameters Command

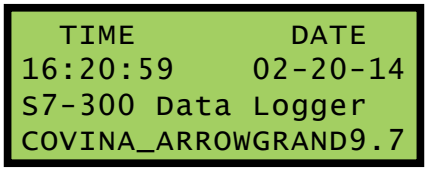
UNIT NAME

The Unit Name serves as a comprehensive logger and site ID. It is included at the top of each report. Data from several Data Loggers can be easily distinguished by providing each unit with a unique and descriptive name. A total of eighty alphanumeric characters can be used to define the Unit Name. It is assigned using the standard Edit Field techniques described in "Working with Fields" on page 16.

A Unit name can be assigned by the user to suit a variety of requirements. As an example, it may include references to a district, city, milepost number, street and DOT designation.

The front panel LCD has a limited capacity to display information. It is limited to 4 lines of 20 characters. The content of the first 3 lines are fixed by the logger's firmware and cannot be changed by the user. The

content of the fourth LCD line always reflects the first 20 characters of the Unit Name as depicted in the following.



When Event Records are saved to a USB flash drive the records are contained in a folder. The folder name is created automatically by the Data Logger. It is a copy of the first 20 characters of the Unit Name just as they appear on the LCD.

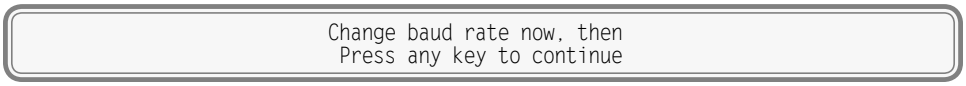
Guidelines and prohibitions regarding the first 20 characters of the Unit Name are detailed in the following.

- The first 20 characters must be unique to each logger. Doing so assures that each USB flash drive folder created by the logger will also be unique, thereby avoiding confusion in the resultant Event Record data files.
- The following Windows-prohibited characters (11 total) cannot be used / \ ? % * : | " < >.
- The first and last characters cannot be a space, period (.) or control character.
- If a space is required for clarity, use the underscore (_) character instead.

TERMINAL PORT BAUD RATE

The Terminal Port Baud rate may be assigned one of ten values. Valid settings are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps. Press the **Spacebar** to select a Baud rate.

The following message will be displayed if the Baud rate was changed.



The user must change the Baud rate of the PC to match the new setting assigned to the VDL.

V-P PORT BAUD RATE

The Vital-processor Port Baud rate may be assigned one of ten values. Valid settings are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps. Press the **Spacebar** to select a Baud rate.

It is strongly recommended that the Baud rate of the Siemens S7-300 serial comm port be left at 9600. Slower rates may introduce slight delays in the time stamping of events. Higher rates place an unnecessary processing load on the system.

ADMINISTRATIVE AND RESTRICTED PASSWORDS

Access to the VDL via any port is protected by a dual level password system. Administrative Access permits unrestricted access to all logger functions. Administrative Access allows the Setup Database to be altered and the Event Record memory to be cleared. The Administrative Password should be known to a limited number of users with a genuine need to know.

Restricted Access permits only limited access to the logger. It allows the user to review, but not alter, the Setup Database and Event Record memories. The Restricted Password can be shared with users that only need access to Event Record data when investigating an incident or resolving a maintenance issue.

The Administrative and Restricted Passwords are defined similarly. Each may be assigned any combination of alphanumeric characters not exceeding eight total. To defeat the password security system assign one of the passwords a null value. This can be done by deleting all of the characters in the password field and then accepting the empty field. When the password challenge is issued the user will be able to access the system by simply pressing the **Enter** key.

Care should be exercised in assigning and saving the Administrative Password. If it is lost or forgotten it will be necessary to contact MICRO-AIDE for assistance.

Passcode

The VDL can be effectively programmed and operated from its front panel. The Passcode is used to protect the logger from unwanted access via the front panel. It must be entered when the user attempts to alter the Setup Database. The Passcode can be assigned any combination of digits not exceeding eight total. Alphabetic characters cannot be assigned to the Passcode.

Ring Count

The Ring Count parameter determines the number of ring cycles that must occur before the modem will answer an incoming call. Setting the Ring Count to a sufficiently large value will allow an on-site maintainer to answer a voice call prior to the VDL answering. The Ring Count can be set in the range from 0 to 99. A setting of 0 will disable the modem's auto-answer feature (i.e., incoming calls will not be answered by the modem).

The following message will be displayed below the last field in the System Parameters command if the optional modem is not installed. No message will appear if the modem is installed.

```
Modem is NOT installed
```

Primary and Secondary Dial Numbers

The Virtual Input feature of the VDL allows users to program a fault reporting capability into the logger. If the fault is detected and the logger is equipped with the optional internal modem, the modem can be enabled to dial out to a maintenance facility and transmit an Event Record that specifies the fault.

The telephone number the modem dials is defined by the Primary and Secondary Dial Number parameters. Dial numbers will generally contain numeric values. An exception to this rule is that parentheses, hyphens and space characters can be placed into the number field for clarity. These characters will be ignored by the modem. Additionally, the comma character can be placed anywhere in the field to create an arbitrary two-second delay. A total of twenty alphanumeric characters can be entered for each of the dial numbers.

The VDL attempts to establish a connection by dialing the Primary Dial Number first. If the connection fails the next attempt is made to the Secondary Dial Number. Successive failures will force the modem to dial alternately between the two numbers. The modem ceases further attempts after ten failures to each number have occurred.

The VDL modem is programmed to accept only reliable connections. Consequently, the far end modem must be programmed to establish connections that use error correction protocols such as LAP-M and MNP 2-4.

Clock Sync Mode

The VDL contains a real-time clock that allows the logger to time stamp Event Records to the nearest tenth of a second. With any clock a small amount of drift can be expected. However, the real-time clock of the VDL can be precisely synchronized by employing either of the following methods.

- SNTP-Multicast or SNTP-Unicast (requires optional Ethernet Port and accessible time server)
- GPS time (requires optional GPS Receiver to be installed)

The Clock Sync Mode setting controls the synchronization method. Press the **Spacebar** to select one of the following methods.

- None: The real-time clock is not synchronized.

The real-time clock of the VDL (if not synchronized) features an accuracy of ±3 ppm, which is approximately ±8 seconds per month.

- SNTP: If the SNTP Server address is set to 0.0.0.0 the Multicast method is employed. This setting effectively disables the Unicast method in favor of Multicast. Otherwise Unicast is selected. Refer to the section entitled "SNTP Server" on page 23.
- GPS: Every hour, on the hour, the real-time clock will be synchronized to GPS time. This occurs provided the GPS Receiver is in acquisition of a valid GPS signal.

As previously stated, the real-time clock can be synchronized automatically by means of a time server. To use this feature the following requirements must be satisfied.

- The time server must be enabled for either Multicast or Unicast operation.
- The various switches, gateways and routers that comprise the LAN must be configured to propagate the required SNTP messaging to and from the time server and Data Logger.

SNTP time synchronization operates as follows:

- If Multicast operation is selected, the VDL will automatically update its clock upon receipt of a Multicast message. In this case, the updates are under the sole control of the time server. They occur at intervals set by the time server.
- If Unicast operation is selected, at five minutes passed every hour (e.g., 18:05:00) the VDL will send a time request message to the time server. The latter will respond with a time and date message. The VDL will receive and validate this message and update its clock accordingly.

A System Event Record is logged to memory whenever the real-time clock is synchronized. This occurs irrespective of the synchronization method selected. Refer to the section entitled "System Events" on page 79 for additional details.

SNTP SERVER

The SNTP Server setting operates in conjunction with the Clock Sync Mode setting as follows:

- Set the SNTP Server address to 0.0.0.0 and the Clock Sync Mode to SNTP to enable Multicast operation.
- Set the SNTP Server address to the address of a suitable time server and the Clock Sync Mode to SNTP to enable Unicast operation.

The I.T. group responsible for the LAN will be able to identify an appropriate time server address as well as configure the time server appropriately.

TIME ZONE

The correct Time Zone setting must be assigned when the GPS or SNTP synchronization method is selected. GPS and SNTP time data is relative to UTC-0 time, previously known as GMT. To display the correct local time the Data Logger must convert the reported UTC time by applying the correct time zone adjustment.

The Time Zone setting can be assigned one of seven different values that are commonly used in North America. Each setting is explained in Table 4 on page 24.

Time Zone Code	Description	Shift from UTC (hours)
AST	Atlantic Standard Time	-4
EST	Eastern Standard Time	-5
CST	Central Standard Time	-6
MST	Mountain Standard Time	-7
PST	Pacific Standard Time	-8
AKST	Alaska Standard Time	-9
HAST	Hawaii Standard Time	-10

Table 4: Time Zone Settings

Daylight Saving Time

The real-time clock of the VDL can be adjusted automatically to compensate for DST. This feature operates independently of the Clock Sync Mode setting. If enabled, the real-time clock will be shifted by one hour on the second Sunday of March and the first Sunday of November. In both cases the clock is adjusted at 2:00 AM.

The DST feature implemented by the VDL is in full compliance with the Energy Policy Act of 2005 which took effect in 2007.

High and Low Temp Limits

The temperature inside the VDL can be measured and reported. If the temperature reaches an extreme value a System Event will be declared and logged to memory. Refer to the section entitled "System Events" on page 79 for additional information. The High and Low Temp Limits are used to define the range of acceptable operation. The settings must range from -67°F to 257°F.

Analog Configuration (A)

The four Analog Inputs of the VDL can be used in a variety of applications. Battery voltages and AC voltage levels can be measured and reported by the Analog Inputs. The user can select an entry from a preset menu that best suits the intended application. A typical response to the Analog Configuration command is shown in the following. Default settings are listed.

```
                        Analog Configuration
Input    Range       Filter*      Low Limit          High Limit
----- ----------     ------      ---------          ----------
 A01  +/-25.5Vdc      Slow         -25.6                25.5
 A02  +/-25.5Vdc      Slow         -25.6                25.5
 A03  +/-25.5Vdc      Slow         -25.6                25.5
 A04  +/-25.5Vdc      Slow         -25.6                25.5

          *Recommend "Slow" for AC
```

Analog Configuration Command

The first column identifies the input. Analog Inputs are consistently labeled by the VDL as "A01", "A02", etc. The A-prefix is always used to distinguish Analog from Digital, Virtual and Timer Inputs. This first column of fields is fixed and cannot be altered by the user. Four parameters can be used to characterize an Analog Input. Each parameter is described in the sections that follow. Table 5 on page 25 lists the Resolution, Filter and Limit Values applicable to each of the seven Ranges.

Range	Resolution	Filter	Low Limit	High Limit
±25.5 Vdc	.1 Vdc	Slow or Fast	-25.6 to 25.5 Vdc	-25.6 to 25.5 Vdc
+51.1 Vdc	.1 Vdc	Slow or Fast	0.0 to 51.1 Vdc	0.0 to 51.1 Vdc
±255 Vdc	1 Vdc	Slow or Fast	-256 to 255 Vdc	-256 to 255 Vdc
25.5 Vac	.1 Vac	Slow or Fast	0.0 to 25.5 Vac	0.0 to 25.5 Vac
255 Vac	1 Vac	Slow or Fast	0 to 255 Vac	0 to 255 Vac
±25.5 Adc	.1 Adc	Slow or Fast	-25.6 to 25.5 Adc	-25.6 to 25.5 Adc
25.5 Aac	.1 Aac	Slow or Fast	-25.6 to 25.5 Aac	-25.6 to 25.5 Aac

Table 5: Analog Input Parameters

RANGE

The Range setting allows the user to configure the Analog Input for DC or AC voltage or DC or AC current measurements. The Range setting also selects the span of voltages or currents that will be monitored. Lastly, the Range setting selects the resolution that will be reported by the measurement. The +51.1 Vdc range is particularly useful in monitoring batteries that may exceed 24 Vdc when charging. The 255 Vac range is useful for monitoring the AC power source connected to a battery charger. The DC and AC current ranges are intended to be used with a MICRO-AIDE external current sensor.

Each of the Ranges identified as AC utilize a true RMS method of measurement. Consequently, these settings can also be used when monitoring inputs with variable DC or pulse content.

FILTER

The Filter parameter can be set to either Fast or Slow. The Fast setting utilizes a time constant of .1 seconds. It is generally used when monitoring DC signals. The Slow setting utilizes a time constant of .64 seconds. It should be used when monitoring AC signals in order to smooth out their ripple content. If the user is unconcerned about the Filter time constant it is best to use the Slow (default) setting.

HIGH AND LOW LIMITS

Analog Inputs are constantly compared to two Limit Values. The High and Low Limit Values define ranges of acceptable and unacceptable operation. Outside the acceptable range the input is considered to be in an abnormal state. An Event Record will be created when the Analog Input transitions into or out of either range.

Figure 3 on page 26 illustrates the relationship of the High and Low Limit Values to the Analog Input state. Each range defines the type of Event Record that is created by transitions of the input. The figure depicts an Analog Input configured to monitor a typical 12 Vdc battery source. The figure indicates that the unacceptable range includes all voltages less than 10.2 Vdc and all voltages greater than 14.5 Vdc. The unacceptable range always consists of two portions separated by the acceptable range. If the input is within the range extending from 10.2 to 14.5 Vdc the battery voltage is considered to be acceptable.

Analog Inputs with levels greater than the Low Limit Value but less than the High Limit Value will create Event Records defined by the inactive or Off Event state. Levels found to be outside these limits will create Event Records defined by the active or On Event state.

In the following illustration, when the signal transitions into the unacceptable range an On Event Record is created and identified with an Event Name of BATT_BAD. When the signal transitions into the acceptable range an Off Event Record is created and identified with an Event Name of BATT_OK.

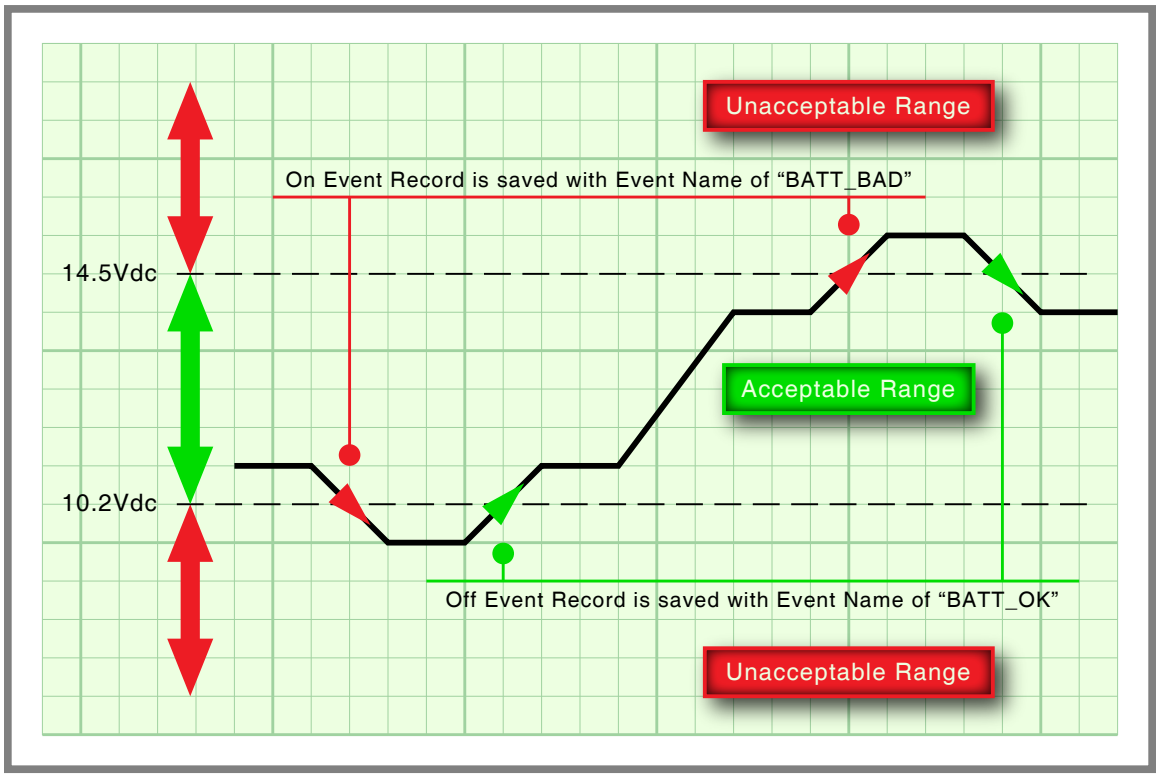

Unacceptable Range
On Event Record is saved with Event Name of “BATT_BAD”
14.5Vdc
Acceptable Range
10.2Vdc
Off Event Record is saved with Event Name of “BATT_OK”
Unacceptable Range

Figure 3: Analog Input Operating Ranges and Limit Values

3

TIMER INPUTS (W)

The VDL includes sixteen general purpose Timer Inputs. Each timer can be programmed individually. A Timer Input can be used to measure the elapsed time between any two events. As an example, the time between Digital Input events can be measured. The time a bit controlled signal is energized or un-energized can be measured. The interval between the loss of adequate BN voltage and a control operation can be measured. Additionally, the user can assign Limit Values to each Timer Input. In this way, time delays that are unacceptably short or long can be reported. Finally, Timer Inputs will generate distinguishable Event Records like any other input. Included in each record is the measured time value.

The relationship shared by the From trigger source, the To terminating source and various event transitions is depicted in Figure 4 on page 27.

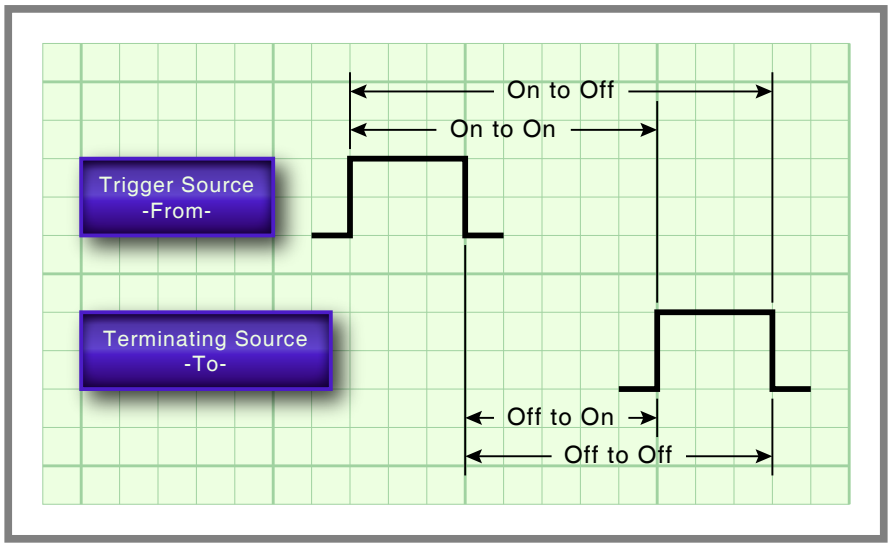


Figure 4: Timer Measurements

An array of fields similar to the following will be displayed after selecting the Timer Input command. In the example cited, parameters for the first Timer Input have been entered. The other fields have retained their factory default settings. Only the first three Timer Inputs are listed.

Timer Configuration

Timer	From	Event	To	Event	LowLimit	HighLimit
T01	D017	Off	D999	Off	7.5	12.5
T02	---	Off	---	Off	0.0	0.0
T03	---	Off	---	Off	0.0	0.0

Timer Inputs Command

3

To program a Timer Input follow the steps listed in the following.

1. Position the highlight anywhere in the row identified by the Timer Input to be programmed (e.g., T01).
2. Move the highlight into the column labeled "From". The From input is used to trigger the timer. Assign it by entering **Dn**, **An** or **Vn** where n is 1 through 999 for Digital Inputs, 1 through 4 for Analog Inputs or 1 through 8 for Virtual Inputs. Leading zeros are not required.
3. Move the highlight to the right into the first column labeled "Event". Assign the trigger event by pressing the **Spacebar** as required to select the On or Off setting.
4. Move the highlight to the right into the column labeled "To". The To input is used to terminate the timer. Assign it by entering **Dn**, **An** or **Vn** where n is 1 through 999 for Digital Inputs, 1 through 4 for Analog Inputs or 1 through 8 for Virtual Inputs. Leading zeros are not required.
5. Move the highlight to the right into the second column labeled "Event". Assign the terminating event by pressing the **Spacebar** as required to select the On or Off setting.
6. Move the highlight to the right into the column labeled "LowLimit". Enter a value within the range of 0 to 999.9 seconds. Any measured time interval that is less than this value will generate an Event Record tagged with an Event Name of Violate.
7. Move the highlight to the right into the column labeled "HighLimit". Enter a value within the range of 0 to 999.9 seconds. Any measured time interval that is greater than this value will also generate an Event Record tagged with an Event Name of Violate.
8. Move the highlight to another row to program an additional Timer Input.
9. After each of the required Timer Inputs are programmed press the **Esc** key to complete the command.

In the example cited previously, the time after Digital Input 17 reaches its On state until Digital Input 999 reaches its Off state will be measured. A measured time interval of 7.5 to 12.5 seconds is considered acceptable. Measured time intervals that are within the range established by the Limit Values will generate Event Records tagged with an Event Name of Nominal. Refer to the following section entitled "Event Names (E)" on page 28 for additional information.

EVENT NAMES (E)

There are two types of Event Records. Active Event Records are created when a Digital Input is defined as a logical 1 by the Siemens S7-300 or when an Analog Input transitions into its unacceptable range as defined by its Limit Values. Conversely, inactive Event Records are created when a Digital Input is defined as a logical 0 by the Siemens S7-300 or an Analog Input is within its acceptable range of operation.

Event Names allow the user to distinguish Event Records from each other in a quick and unambiguous manner. They should not be confused with Input Names and Input Identifiers (see next section). Event Names always occur in pairs. The On Event and Off Event names form the pair. They in turn distinguish the active and inactive Event Records, respectively.

As many as twenty Event Name pairs can be defined. Once the pairs are defined they can be assigned to inputs of the VDL in any manner that helps the user distinguish Event Records precisely and quickly. By way of example, the Event Records for Digital Input 1 could be labeled "XR_On" and "XR_Off". The Event Records for Analog Input A1 could be labeled "Bat_Norm" and "Bat_Fail".

A typical response to the Event Name command is shown in the following. In the interest of brevity only four of the twenty pairs are listed (i.e., 1-3 and 20). The factory default Event Names are shown.

```
                    Event Names

Number  ON Name  OFF Name
------ --------  --------
   1   On        Off
   2   On        Off
   3   On        Off


  20   Violate   Nominal
```

Event Names Command

To define a new Event Name simply position the highlight to the desired field and type the new name. Event Names are restricted in length to eight characters. They can be formed by any combination of letters, numbers and syntax symbols.

As an aid to the user Event Name pair 20 is by default labeled "Violate" and "Nominal". Furthermore, pair 20 is by default assigned as the Event Name pair to all Timer Inputs. The pair assignment and names can, however, be changed by the user to better suit the intended application.

INPUT NAMES / IDENTIFIERS (I)

The VDL utilizes two types of inputs. The four Analog Inputs are referred to as physical inputs because actual circuits are wired to the logger's input connectors. The VDL also includes 999 Digital, eight Virtual and sixteen Timer Inputs. Contrary to physical inputs, Virtual and Timer Inputs are defined by the user for the purpose of detecting failure or alarm conditions among the physical inputs. Refer to the section entitled "Virtual Inputs (V)" on page 29.

All inputs, regardless of type, share one common programming characteristic. The user can define a unique Input Name, Input Identifier and Event Name pair to each input. The Input Name can be any combination of alphanumeric characters not exceeding twenty total. The Input Name appears in each Event Record created by the input in question. It is the primary means by which inputs are distinguished.

The Input Identifier can be thought of as an abbreviated name. It is limited in length to eight alphanumeric characters. It too appears in the Event Record. It is primarily used to distinguish Event Records

displayed on the LCD panel of the logger. Several of the setup commands use the Input Identifier rather than the lengthier Input Name to reference inputs.

The Event Name pairs are described in the preceding section. As many as twenty Event Name pairs can be defined by the user. Each pair is identified by a number ranging from one to twenty. After the pairs are defined the Input Names / Identifiers command is used to assign Event Name pairs to inputs. The Event Name pair can be assigned by using either of two methods. The **Spacebar** can be repeatedly pressed when the highlight is located within the OnEvent / OffEvent field until the desired pair is listed. Alternatively, the number of the required Event Name pair can be entered in the last column.

A typical response to the Input Names / Identifiers command is shown in the following. Only the first three Digital Inputs and Timer Input T16 have been listed. Analog Inputs follow Digital Inputs. The Virtual Inputs follow the Analog Inputs. They are followed by the Timer Inputs.

```
                        Input Names/Identifiers
 Input          Name             ID      OnEvent/OffEvent Event Pair
 -----  --------------------  --------  ----------------- ----------
  D001 Digital Input 001     DInpu001        On/Off            1
  D002 Digital Input 002     DInpu002        On/Off            1
  D003 Digital Input 003     DInpu003        On/Off            1


  T16  Timer 16              Timer16    Violate/Nominal       20


[F1]=Next Page [F2]=Prev Page
```

Input Names / Identifiers Command

Fifty-two data screens are required to list all 1027 Digital, Analog, Virtual and Timer Inputs. To advance to the next screen press the **F1** function key. To return to the previous screen press the **F2** function key.

VIRTUAL INPUTS (V)

Virtual Inputs are a unique feature only found in MICRO-AIDE's family of Event Recorders and Data Loggers. The VDL is a powerful, general purpose recording device that can be used to satisfy the data logging demands of a variety of applications. A recording device is frequently used to gather data on a failure condition thought to exist in a control circuit. The failure condition may occur intermittently. The need to log data over a significant period of time will often impose an additional requirement upon the device. The suspected failure can often be defined as the abnormal occurrence of states. The normal operation of the circuit predicts that only certain states can occur. It follows that any deviation from these normal states suggests a failure that should be flagged and carefully examined.

Identifying failures that occur as the result of abnormal states is greatly simplified by using the Virtual Input feature. Each VDL allows as many as eight Virtual Inputs to be defined. Each Virtual Input is defined by specific logical associations among particular Digital, Analog or other Virtual Inputs.

Virtual Inputs are defined by two essential properties. The first property concerns the selection of variables. Variables are merely the inputs that will be checked to determine if a Virtual Input event is to be logged. The number of variables that define the Virtual Input can range from one to four. Variables can be Digital Inputs, Analog Inputs, other Virtual Inputs or Timer Inputs. Assigning a Virtual Input as a variable to another Virtual Input is referred to as nesting. Nesting allows the user to create a higher level Virtual Input that evaluates more than four variables.

The second property pertains to the state of each assigned variable. A fault condition in a control circuit can only be identified if the state of each variable is properly evaluated. The state of a variable is defined by the VDL as either On or Off. Both states are described in the following.

On–The Digital Input is defined as a logical 1 by the S7-300. The Analog Input level is outside the acceptable range as defined by the region between the Limit Values (refer to Figure 3 on page 26). The Virtual Input evaluates to a true logic state. The Timer Input has reported a timed interval that is either too fast or too slow as compared to its assigned High and Low Limit Values, respectively (refer to the section entitled "Timer Inputs (W)" on page 26).

Off–The Digital Input is defined as a logical 0 by the S7-300. The Analog Input level is within the acceptable range as defined by the region between the Limit Values. The Virtual Input evaluates to a false logic state. The Timer Input has reported a timed interval that is within its range of assigned High and Low Limit Values.

The procedure used to define Virtual Inputs is described in the following two sections.

ASSIGNING VARIABLES

An array of fields similar to the following will be displayed after selecting the Virtual Inputs command. In the example cited, only variables for Virtual Input V3 have been entered. The other fields have retained their factory default settings.

```
                Virtual Input Parameters
Input  Function of:        Relay Dial Out
-----  ---- ---- ---- ---- ----- --------
 V01   ---  ---  ---  ---    No     No
 V02   ---  ---  ---  ---    No     No
 V03   D999 D007 A04  ---   Yes     No
 V04   ---  ---  ---  ---    No     No
 V05   ---  ---  ---  ---    No     No
 V06   ---  ---  ---  ---    No     No
 V07   ---  ---  ---  ---    No     No
 V08   ---  ---  ---  ---    No     No

 [F1] to edit virtual output function
```

Virtual Inputs Command

To assign variables perform the following steps in the order described.

1. Position the highlight anywhere in the row identified by the Virtual Input to be programmed (e.g., V3). Then move the highlight within the row to the extreme left-most column.

2. Assign the first variable by entering **Dn**, **An**, **Vn** or **Tn** where n is 1 through 999 for Digital Inputs, 1 through 4 for Analog Inputs, 1 through 8 for Virtual Inputs or 1 through 16 for Timer Inputs. Leading zeros are not required.

3. Move the highlight to the right. Assign the remaining variables using the previous step. Not all fields need to be assigned a variable. To remove a variable press the **0** key or simply delete all of the characters in the field.

4. Move the highlight to the field in the column labeled "Relay". Press the **Spacebar** to select the desired setting. The Yes setting will operate the internal relay if the Virtual Input definition is satisfied. The relay will remain in its energized state for as long as the conditions that define the Virtual Input persist. The No setting leaves the relay unaffected by the Virtual Input.

5. Move the highlight to the field in the column labeled "Dial Out". Press the **Spacebar** to select the desired setting. The Yes setting will allow the internal modem (if installed) to dial the telephone numbers defined by the Primary and Secondary Dial Number parameters. Refer to the section entitled "Primary and Secondary Dial Numbers" on page 22. If the modem is able to connect with the far end an Event Record for the Virtual Input will be issued.

6. Press the **F1** function key to proceed to the next step.

A sample response listing three variables is shown in the following. To complete the definition of the Virtual Input the state of each variable must now be assigned.

```
                    Virtual Output Function
Inputs:                                                  Output:
   D999      D007      A04       ---                       V03
 POK Rly App Lite  Battery                               VInput03
-------- -------- -------- --------                     --------
  POK Up  Lite On Bat Norm                              Alrm Off
 POK Dwn  Lite On Bat Norm                              Alrm Off
  POK Up Lite Off Bat Norm                              Alrm Off
 POK Dwn Lite Off Bat Norm                              Alrm Off
  POK Up  Lite On  Bat Bad                              Alrm Off
 POK Dwn  Lite On  Bat Bad                              Alrm Off
  POK Up Lite Off  Bat Bad                              Alrm Off
 POK Dwn Lite Off  Bat Bad                               Alrm On
```

Assigning States to Virtual Inputs

SELECTING STATES

Before proceeding further the table of state selection fields must be understood. Each Virtual Input will have its own data table. However, the basic structure of each table will remain the same. Refer to the sample data entitled "Assigning States to Virtual Inputs" on page 31. Each row lists, from left to right, the Input Numbers that are assigned to each variable (e.g., labeled "D999", "D007" and "A04"). Unassigned variables are labeled "---". The last column of the third line lists the Input Number of the Virtual Input being defined (e.g., labeled "V03"). Directly below the Input Numbers on the fourth line of text is listed the Input Identifier for the variable. For the sample data shown the Input Identifiers are labeled "POK Rly", "App Lite" and "Battery". The Virtual Input has retained its default Input Identifier, labeled "VInput03".

The remaining lines of text will vary with the number of assigned variables. One variable will list two lines of text. Two variables will list four lines of text. Three variables will list eight lines of text. Four variables will list sixteen lines of text. Each line will specify a state for each of the assigned variables (i.e., inputs). Each state is identified by its user-defined Event Name. The states for the variable labeled "POK Rly" are "POK Up" and "POK Dwn". The sample data includes three variables, so eight lines of text lists all of the possible variable states.

The last column of data in each line includes a selection field. The field can be set, line by line, to an active or inactive state. The user decides which state to assign to the Virtual Input for each combination of variable states. For the sample data shown, the Virtual Input is assigned to its active state (labeled "Alrm On") when the variable's states are POK Dwn, Lite Off and Bat Bad. Anytime this combination of states is found to exist among inputs D999, D7 and A4, respectively, an active Event Record for Virtual Input V3 will be created and stored in memory. An additional, inactive Event Record will be created when the variable states no longer satisfy these requirements.

Perform the following steps to complete the Virtual Input programming procedure.

1. Move the highlight to the first line of text that lists the input states.
2. Press the **Spacebar** to select the correct Event Name for that combination of input states.
3. Move the highlight to the next line and repeat the preceding step.
4. When the Virtual Input state is correctly defined for each line press the **Esc** key and return to the variable assignment table.
5. Press the **Esc** key to exit the command or reposition the highlight and select the next Virtual Input. Repeat both of the previously described procedures as required.

NETWORK (N)

The Network command is used to configure the Ethernet Port. A set of six user-assigned fields with data similar to the following will be displayed after the command is selected.

```
                        Network Setup
                        -------------
IP Address              192.168.  0.100
Subnet Mask             255.255.255.  0
Gateway                   0.  0.  0.  0
Ethernet MAC Address    00-08-DC-01-23-45
Port                              5000
TCP/IP mode             Raw TCP/IP
```

Network Command

A description of each field follows.

IP ADDRESS

The IP Address must be set in accordance with the requirements of the LAN or the same as the address used by the TCP/IP connection of the PC. The initial setting is typically 192.168.0.100.

SUBNET MASK

The Subnet Mask must also be set in accordance with the requirements of the LAN. A value of 255.255.255.0 should be acceptable for a directly connected PC. The initial setting is typically 255.255.255.0.

GATEWAY

If a Gateway is being used by the LAN it too must be set in accordance with the LAN requirements. A setting of 0.0.0.0 is acceptable for a directly connected PC or a LAN when communications through a Gateway are not required. The initial setting is typically 0.0.0.0.

ETHERNET MAC ADDRESS

The first three numbers that comprise the MAC Address must be 00-08-DC. They must not be changed as they are uniquely associated with the Ethernet module used by the VDL. The remaining three numbers must not be shared by any other Ethernet device on the LAN. The initial setting is 00-08-DC-aa-bb-cc, where aa-bb-cc is the serial number assigned by MICRO-AIDE to the logger. By way of example, a VDL with a serial number of 12345 will have a factory assigned MAC Address of 00-08-DC-01-23-45. This address is guaranteed to be unique.

Use extreme caution in modifying the logger's MAC Address. Serious LAN conflicts will be created if duplicate MAC Addresses are allowed to exist. Also, restoring a Setup Database will alter the MAC Address if the saved database includes a different MAC Address.

PORT

The Port assignment must also be selected in accordance with the requirements of the LAN. For a directly connected PC any value greater than 1024 is acceptable. The initial setting is typically 5000.

TCP/IP MODE

A Selection Field is used to assign the TCP/IP Mode setting. Press the **Spacebar** to select either Raw TCP/IP or Telnet. Generally, the Raw TCP/IP setting is acceptable. However, the Telnet setting must be used when the Setup Database is being uploaded or downloaded using HyperTerminal. These data transfers rely upon the Xmodem protocol which always deals with binary data. To insure data transparency, Telnet mode must be selected for all Xmodem transfers. Raw TCP/IP is the initial setting.

Press the **Esc** key after all of the fields are properly defined. The following message will be displayed if the MAC Address was altered.

```
CHANGE MAC ADDRESS (normally 00-08-DC-xx-xx-xx), are you SURE?
                                No Yes
```

Select Yes to proceed. Finally, the following message will confirm the change(s) to be made.

```
Network settings changed, restart network now?
No Yes
```

The six fields that comprise the Ethernet Port settings can only be altered by use of the Network command or by uploading a different Setup Database. The Reset System command will not change any of the Network settings.

If a Telnet connection is idle for more than five minutes a timeout condition will occur. The timeout will result in a forced disconnection at the VDL end. The user will then have to initiate a new connection procedure to re-establish communications with the logger. The timeout duration and forced disconnection is performed so that in the event of a connection failure anywhere in the network, the logger will be prepared to complete a subsequent connection attempt. However, to be successful the subsequent connection attempt must occur no sooner than five minutes after the communications disruption. The logger will automatically recover from communication failures of less than five minutes duration provided the user end does not perform a disconnect.

PRINT SETUP DATA (P)

The Print Setup Data command can be used to display the setup parameters assigned by the user. The following menu of sub-commands is displayed after selecting the Print Setup Data command.

```
Print Setup Data

P Print All
E Print Event Names
I Print Input Names/Identifiers
A Print Analog Configuration
V Print Virtual Inputs
T Print Timer Configuration
N Print Network Settings
S Print System Parameters
```

Print Setup Data Command

The Print All command can be used at the end of the Setup Procedure to display the entire Setup Database. The remaining commands are used to display specific portions of the Setup Database.

The Print All command will issue a lengthy stream of data that will exceed the viewing capacity of a single terminal screen. The user may wish to temporarily pause the data for better viewing. Refer to the procedure entitled "Data Flow Control" on page 16.

TRANSFER FILES (T)

A VDL will require a considerable amount of data entry if every input is assigned an Input Name, Event Name pair, etc., that differs from its factory default value. In the event of an accidental loss of data memory (e.g., a reset performed by mistake) each Input Name and Event Name pair will need to be re-entered. The Transfer Files command provides the user with a quick and simple data exchange alternative to re-entering the Setup Database by hand.

The Download Setup Data command is used to transmit the Setup Database to a data storage system. A PC running a communications program like HyperTerminal makes an ideal storage system. A file containing the setup parameters can be permanently saved on the hard disk or a flash drive for later retrieval via the Upload Setup Data command.

To initiate a download or upload of the Setup Database, execute the Transfer Files command. The following sub-menu will be displayed. The transfer Setup Database procedures are described in the two sections that follow.

```
File Transfer

D Download Setup Data VDL to PC
U Upload Setup Data PC to VDL
F Firmware Upload
```

Transfer Files Command

DOWNLOAD SETUP DATA (D) - SAVING THE DATABASE

Before the Setup Database can be saved the PC and communications program must be properly configured. The following list describes the correct configuration.

- Transfer protocol: Xmodem.
- Connection: If the logger's Terminal Port is being used select Direct connect-Com1 or Direct connect-Com2 (whichever is available). If the modem is being used the host modem must be logged-on with the logger.
- Baud rate: as required by the Terminal Port and set to 8-N-1 (does not apply when connected via the USB Device Port or modem).

The failure to select the proper transfer protocol (i.e., Xmodem) is the most common mistake made in this procedure.

To save the Setup Database to a PC file select the Download Setup Data command. The following message will be displayed.

```
Sending Setup Data via XMODEM... (Ctrl-X to stop)
```


The steps necessary to complete the download depend upon which communications application is being used. The following example describes the HyperTerminal method. HyperTerminal 7.0 was used in the following procedure. Other versions of this program may be slightly different. However, the fundamental approach will remain valid.

HYPERTERMINAL

1. With the mouse, click on the Transfers command, then the Receive File... command. The Receive File dialog box will open. Verify that the Xmodem protocol is selected.
2. Select the correct disk drive and folder. Click the Receive button. The Receive Filename dialog box will open.
3. Enter a filename (e.g., setup_10.bin). The three-character file extension must be defined. If the various settings are correct click on the OK button.
4. An information box will automatically open. It will indicate the progress of the transfer. After a few seconds (depending upon the Baud rate) the information box will close automatically to indicate a successful transfer.
5. After the successful completion of the transfer the VDL will issue the following message.

```
Transfer complete
Press any key to continue
```

The following message is issued if the file is not promptly opened after initiating the download.

```
Transfer error
Press any key to continue
```

The user can then make a second attempt by selecting the Download Setup Data command again.

UPLOAD SETUP DATA (U) - RESTORING THE DATABASE

Before the Setup Database can be restored to the logger it must have been previously saved. Refer to the procedure entitled "Download Setup Data (D) - Saving the Database" on page 34. The PC and communications program must be properly configured before the Setup Database can be restored. The following list describes the correct configuration.

- Transfer protocol: Xmodem.
- Connection: If the logger's Terminal Port is being used select Direct connect-Com1 or Direct connect-Com2 (whichever is available). If the modem is being used the host modem must be logged-on with the logger.
- Baud rate: as required by the Terminal Port and set to 8-N-1 (does not apply when connected via the USB Device Port or modem).

The failure to select the proper transfer protocol (i.e., Xmodem) is the most common mistake made in this procedure.

To restore the Setup Database to the logger from a PC file select the Upload Setup Data command. The following message will be displayed.

```
Are you SURE you want to upload new Setup Data from PC to VDL?
                                        No Yes
```

Select No to abort the upload. Select Yes to proceed. If the user elects to proceed with the upload the following message will be displayed.

```
Receiving Setup Data via XMODEM... (Ctrl-X to stop)

                                                    CCCCC
```

The sequence of C characters indicates the logger is waiting for the Xmodem file.

The steps necessary to complete the upload depend upon which communications application is being used. The following example describes the HyperTerminal method. HyperTerminal 7.0 was used in the following procedure. Other versions of this program may be slightly different. However, the fundamental approach will remain valid.

HYPERTERMINAL

1. With the mouse, click on the Transfers command, then the Send File... command. The Send File dialog box will open. Verify that the Xmodem protocol is selected.
2. Select the correct disk drive, folder and filename (e.g., setup_10.bin). If the various settings are correct click the Send button.
3. An information box will automatically open. It will indicate the progress of the transfer. After a few seconds (depending upon the Baud rate) the information box will close automatically to indicate a successful transfer.

After the successful completion of the transfer the VDL will issue the following message.

```
Upload completed
Press any key to continue
```

The following message will be issued if the file is not promptly sent after initiating the upload.

```
Transfer error
Press any key to continue
```

The user can then make a second attempt by selecting the Upload Setup Data command again.

LOG OFF (X)

The Log Off command is used to terminate Administrative and Restricted Access sessions. If the previous user logs off of the VDL, access can be regained only by entering the correct password. If the previous user fails to log off, a second user will be allowed access without entering a correct password.

All sessions should be terminated by executing the Log Off command.

To log off of the VDL, access the Main Menu and then press the **X** key. The following message will be displayed.

```
About to Log Off, are you sure?
No Yes
```

Log Off Command

If the user proceeds with the log off the current session will be immediately terminated.

This completes the Setup Procedure for the VDL S7-300. The logger is now prepared to log events in accordance with the setup performed by the user. Since the installation and setup of the logger are critical to how the VDL will perform, it is advisable to review the steps taken earlier.

The next chapter describes how to operate the VDL.

Chapter 4 – Operation

Introduction

This chapter describes how to operate the VDL S7-300 from a PC running a suitable communications program. Local (i.e., on-site) as well as remote methods of operating the Data Logger are described. Before the logger can be operated it must be properly installed and set up. A PC must be online with the logger. The use of the LCD panel and keypad are described in the next chapter.

Multi-User Operation

A unique feature of all MICRO-AIDE Event Recorders and Data Loggers is their ability to handle simultaneous operation from multiple users via the Terminal Port, Ethernet Port, modem, front panel keypad, or in the case of the VDL, via the USB Device Port. This multi-user capability eliminates the annoying practice in some devices of one user effectively locking-out a second or third user.

Remote Operation

The setup procedures and operational capabilities of the VDL can be exercised remotely via the optional Ethernet Port or internal modem. The Ethernet Port is capable of supporting a Telnet connection via TCP/IP. The modem will operate at speeds up to 33,600 Baud. It provides industry standard error correction and data compression features. An Ethernet- or modem-equipped PC running a communications program (e.g., GEA or HyperTerminal) makes an ideal remote access system. Event Records and other data from several remote Data Loggers can be easily gathered and saved as a file on a hard disk or flash drive.

There are a few steps the remote user or host system must perform before remote access is possible. Each of these steps is described in the sections that follow.

Establishing an Ethernet Connection

An Ethernet connection can only be established if the logger's optional Ethernet Port is properly configured. An IP Address and Port Number must be assigned. The procedure for doing so is described in the section entitled "Network (N)" on page 31. Perform the steps listed in the following to establish an Ethernet connection. The procedure assumes that the user will access the logger via a LAN.

1. Assign an IP Address and Port Number to the logger's Ethernet Port in accordance with the requirements of the LAN.
2. Connect the VDL to either a switch or hub device using a CAT-5 cable.
3. Configure the communications application (e.g., HyperTerminal) to connect using TCP/IP (Winsock).
4. Within the communications application enter the logger's IP Address and Port Number as the target IP Address and associated Port Number. HyperTerminal refers to the target device as a host.
5. Click the appropriate icon that initiates the connection.

The procedure described previously is the same if the PC is connected directly to the logger. A successful connection is indicated by a log-on password request regardless of the interconnection method employed.

Establishing a Modem Connection

A standard telephone line must be attached to the modem of the VDL. To access the logger the host system must dial the telephone number of the VDL and wait for an answer. The logger's modem will answer after a predetermined number of rings. Refer to the section entitled "Ring Count" on page 22. The modems will then handshake. The handshake ensures that the modems can communicate with each other at an appropriate speed. A connection is established upon the successful completion of the handshake.

The VDL will only permit reliable connections to be established. The host modem should be programmed for MNP 2-4 or LAP-M operation.

Logging On

Immediately after a connection is established the VDL will issue a password request similar to the following.

```
Siemens S7-300 Data Logger. Ver 1.13 (C) 2011 MICRO-AIDE INC.

***** NOT SET *****

Event storage capacity: 284,785

Enter password:
```

Password Request

The host system must issue the correct password followed by an **Enter**. Passwords are defined in accordance with the procedure entitled "Administrative and Restricted Passwords" on page 21.

The default Administrative and Restricted Access passwords are **PASSWORD** and **LOOKWORD**, respectively. Passwords are case sensitive.

The host system is given three attempts to enter the correct password. A third error will result in a disconnect by the logger. This procedure prevents unwanted users from accessing the logger. After the password is entered the user will be able to operate the logger in a manner identical to that specified by local operation. Accordingly, the VDL will display the Main Menu of commands. Refer to the sample data entitled "Main Menu" on page 15.

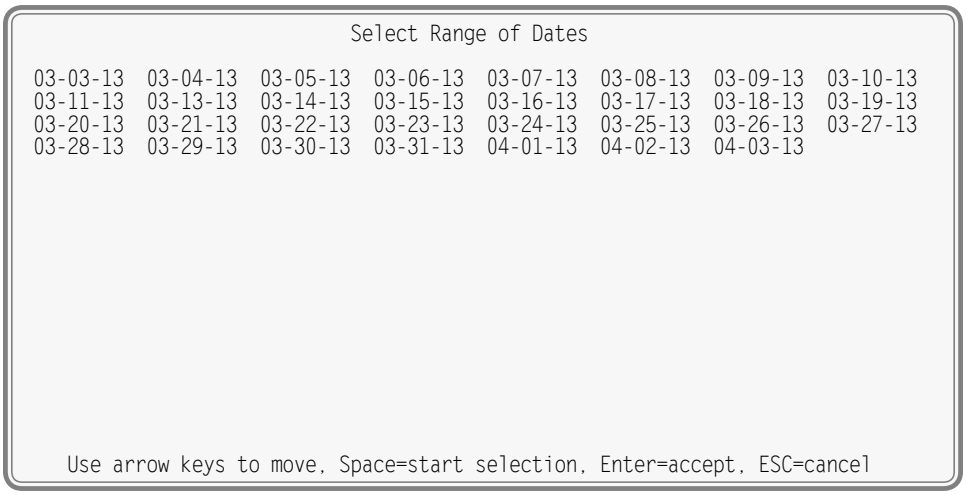
How to Operate the VDL

An explanation of each operational command is included in the remaining sections of this chapter. Operational commands may be executed in any sequence. The user may wish to perform operations in one sequence and then, depending upon the observed data, perform a different sequence of commands. Each command is listed by its name (as it appears in the Main Menu) followed by its command code contained within parenthesis.

Query Events (Q)

The Query Events command provides the principal means by which Event Records are inspected. It allows the user to inspect events for a particular time frame and/or specific set of inputs. Additionally, the Query Events command includes several data output options that can be selectively employed depending upon the user's data display requirements.

The following sample data shows a typical response to the Query Events command.



Query Events Command - Table of Dates

The data array forms a table of dates in MM-DD-YY format. The table indicates that at least one Event Record was logged in memory for each day listed. Days where no records were logged will not be included in the table (e.g., 03-12-13). The VDL can store Event Records for 128 different dates provided the event storage capacity is not exceeded.

The VDL utilizes a rotating memory. Records from the 129th day will automatically over-write records from the first day regardless of how many records are stored in memory.

The first step in using the Query Events command is to select the date or range of dates that the user wishes to inspect. Slightly different procedures are used to select a single date or range of dates. Both procedures are described in the following.

4

SELECTING A SINGLE DATE

1. Using the appropriate arrow keys highlight the single date of interest.
2. Press the **Enter** key.

SELECTING A RANGE OF DATES

1. Using the appropriate arrow keys highlight the first date in the range.
2. Press the **Spacebar** to anchor one end of the range to be highlighted.
3. Press the appropriate arrow keys until each date in the desired range is highlighted.
4. Press the **Enter** key to accept the highlighted range of dates.

The **Esc** key can be pressed at any time to cancel the selection. The user will then be returned to the Main Menu.

QUERY REPORT MENU

After the date(s) is selected, an array of Selection and Edit Fields entitled "Query Report" will be displayed. The following sample data shows a typical Query Report.

```
                              Query Report

                  Start Date:          03-14-13
                  Start Time:          00:00:00

                  End Date:            03-14-13
                  End Time:            23:59:59

                  Include Details:          Yes

                  Reverse order:             No
                  Report Type:             Dump

Inputs:
(blank=all)

                          [F1]=Execute Report, ESC=cancel
```

Query Report Menu

The Event Records of interest to the user can be further qualified by the six fields listed in the Query Report menu. The use of each field is described in the sections that follow.

START TIME

Event Records that are time stamped after the assigned Start Time (for the day selected as the Start Date) will be issued by the Query Command. The Start Time can be assigned any value from 00:00:00 to 23:59:59. The default setting is always 00:00:00. The Start Time must be entered in military format.

END TIME

Event Records that are time stamped before the assigned End Time (for the day selected as the End Date) will be issued by the Query Command. The End Time can be assigned any value from 00:00:00 to 23:59:59. The default setting is always 23:59:59. The End Time must be entered in military format.

INCLUDE DETAILS

The VDL can format Event Records in two different ways. Press the **Spacebar** to select one of the formatting options described in the following.

A complete explanation of Event Record formats is included at the end of this chapter. Refer to the section entitled "Event Record Formatting" on page 43. The numbers included in each of the headings listed in the following specify the number of lines of text each formatting option will create.

Yes (2)–The status of each Digital Input, the level of each Analog Input and the status of each Virtual Input is listed with data concerning the input that created the record.

No (1)–Only information concerning the input that created the record is listed.

REVERSE ORDER

The Reverse Order option can be set to either No (default setting) or Yes. The default setting will result in the oldest records being issued first. They will be followed by newer records. If enabled, the Reverse Order option will issue the most recent records first. In either case, Event Records are always issued in chronological sequence.

REPORT TYPE

The Report Type field can be set to Dump (default setting), Browse or Comma. The proper selection depends upon the user's requirement. Each option is described in the following sections.

Dump–The Dump option is used if a large number of records are to be inspected or captured to a PC file. Refer to the section entitled "Capturing Event Records to a PC File" on page 47. The Dump option will issue Event Records in a continuous stream. The streaming of records will only cease when the last record is issued or the user executes a Pause or Abort command. Refer to the section entitled "Data Flow Control" on page 16.

Browse–The Browse option allows the user to inspect a set of records one screen at a time. It will typically display eleven one-line records or seven two-line records. The same set of records will be displayed indefinitely until the user presses an arrow key to review additional records. The Browse option is most useful when a limited number of records in a narrow time frame need to be reviewed.

A completely new screen of records can be displayed by pressing the up and down arrow keys. The next record in the chronological sequence can be added to the display set by pressing the left and right arrow keys. The last line of text in each screen explains the use of the arrow keys.

Comma–The Comma option formats the Event Record data so that it can be easily imported to a spreadsheet or database application such as Excel® or Access®, respectively. However, the records in question must first be written to a PC file. Refer to the section entitled "Capturing Event Records to a PC File" on page 47. This option takes the various data fields that comprise a record and separates them with a comma. Intervening spaces are eliminated. The processing application will place the record fields into cells or fields that satisfy its own processing requirements. This formatting technique is frequently referred to as Comma Separated Values (CSV). The Comma report option is described in detail in the section entitled "CSV Report Type" on page 45.

When the Report Type is set to Comma the Include Details setting is ignored. All Event Records for the selected time period will be issued and similarly formatted.

INPUTS

The Inputs field allows the user to inspect Event Records from specific inputs. The default setting (Inputs field is blank) will issue records from all inputs. To select specific inputs a valid Input Number must be entered. Digital Inputs are entered as **Dn**, where n is 1 through 999. Analog Inputs are entered as **An**, where n is 1 through 4. Virtual Inputs are entered as **Vn**, where n is 1 through 8. Timer Inputs are entered as **Tn**, where n is 1 through 16. System Event Inputs are entered as **Sn**, where n is 1 through 6. Leading zeros are not required.

System Event Inputs are another type of non-physical input that can create Event Records. System Event Records are used to report the status of the logger at a specific moment in time. Refer to the section entitled "System Events" on page 79 for additional details.

Multiple inputs can be selected by using the following methods. Separate two Input Numbers by a single space character. Select a contiguous range of inputs by including a - (hyphen) between two n numbers. The contiguous range option can be applied to all input types.

The set of Input Numbers must be terminated by pressing the **Enter** key. The following example illustrates a typical Inputs field entry.

```
Inputs: d2 D5-8 a3 d999 v7 A1-2
(blank=all)
```

As the example indicates, the input type designator can be entered as an upper- or lower-case letter. Input Numbers can be entered without regard to sequence. Event Records for Digital Inputs 2, 5, 6, 7, 8, 999, Analog Inputs A1, A2, A3 and Virtual Input V7 will be issued.

After the inputs are selected the user must press the **F1** function key to complete the command. Event Records will then be issued in accordance with all of the settings selected by the user. Event Records will automatically cease being issued when the Report Type is set to Dump or Comma. After the last Event Record a message similar to the following will be displayed.

```
Number of records = 24  Checksum = 93F4
End of report
Hit any key to continue
```

Record Count and Checksum

The exact number of records included in the report is always specified. A checksum is also included. The checksum is calculated from the first character of the first record through the last character of the last

record. Any report that issues the same set of records will always list the same checksum value regardless of when the report was generated. Accordingly, alteration of the record data can be detected provided the original data and checksum are known.

VIEW EVENTS (V)

The View Events command allows the user to display Event Records in real-time. Immediately after an event is detected its corresponding Event Record will be issued to the active user port (i.e., Terminal, Ethernet, USB Device or modem). This command can be very useful in tracking events that are occurring while the user is online with the logger. It can also be used effectively during the Initial Check-Out Procedure to verify that each input is properly cabled. The records can simultaneously be written to a text file. Refer to the section entitled "Capturing Event Records to a PC File" on page 47.

The following message will be issued after the command has been selected.

```
                          View Events Report

                  Include Details:         Yes

Inputs:
(blank=all)

                          [F1]=Execute Report, ESC=cancel
```

View Events Command

The Event Records of interest to the user can be qualified by the two fields listed in the View Events Report. The use of each of these fields is described in the following sections.

INCLUDE DETAILS

This setting allows the user to select the level of detail to be included in each Event Record. Refer to the section entitled "Event Record Formatting" on page 43 for additional information regarding the use of this field.

INPUTS

The use of the Inputs field allows the user to review records from specific inputs. The use of this field is described in the section entitled "Inputs" on page 41.

After the selection fields are assigned press the **F1** function key to start the report. The logger will continue to issue records as they occur in real-time. Press the **Esc** key to terminate the report.

LIVE STATUS (L)

The Live Status command can be very useful in verifying that inputs are wired and labeled correctly. Additionally, it can be used to determine if the inputs are operating properly. It provides a single-screen snapshot of the present state of various logger inputs (i.e., Digital, Analog and Virtual). The state or measured value of each input is continuously and automatically updated. The Live Status report indicates the state of each Analog and Virtual Input by the use of its user-assigned Input Identifier and Event Name. The latter are described in the sections entitled "Input Names/Identifiers (I)" on page 28 and "Event Names (E)" on page 28, respectively.

To properly view the Live Status report the PC must be configured to emulate an ANSI terminal.

Four data screens are required to display all 1011 Digital, Analog and Virtual Inputs. The following is an example of the first screen used by the Live Status report.

```
                              Live Status                09:41:21 02-20-14

   D001-D032 X . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

   D033-D064 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

   D065-D096 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

   D097-D128 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

   D129-D160 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

   D161-D192 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

   D193-D224 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

   D225-D256 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

 VInput01: Off       VInput05: Off         Bat_24   24.3Vdc     Good
  Alarm_2: Active    VInput06: Off        AC_110V     89Vac  AC_Fail
 VInput03: Off       VInput07: Off       AInput03    0.0Vdc      Off
 VInput04: Off       VInput08: Off        Battery   13.4Vdc   Normal

[ESC]=exit [F1]=next page [F2]=prev page
```

Live Status Report - Digital and Analog Inputs

The Live Status report includes a header that lists the present time and date. The states of the first 256 Digital Inputs are listed in the eight lines of text that follow the header. The VDL uses the same convention employed by MICRO-AIDE Event Recorders for labeling input states. An X or . (period) character is used to indicate the state as either On (active) or Off (inactive), respectively.

The status of Digital Inputs is controlled and reported by the Siemens S7-300. The VDL considers a logic 1 reported by the S7-300 to be On and a logic 0 to be Off.

Press the **F1** and **F2** function keys to view the Live Status of additional Digital Inputs. The next four rows of text in each screen provide information regarding the eight Virtual Inputs and four Analog Inputs.

The sample data indicates that Digital Input 1 is active. The other Digital Inputs are inactive. The DC voltage source connected to Analog Input A1 is acceptable at 24.3 Vdc and is therefore reported as being in a Good state. The AC voltage monitored by Analog Input A2 is low at 89 Vac. The Battery potential at Analog Input A4 is 13.4 Vdc, which is considered to be Normal. Finally, the low AC voltage has caused Virtual Input 2 (Input Identifier of Alarm_2) to be activated.

EVENT RECORD FORMATTING

Event Records provide the user with information about the status of each input at a specified moment in time. Event Records consist of printable ASCII characters. Two different formatting methods are employed by the VDL. They create one- and two-line records. The formatting options are referred to as No Details and Include Details. Respectively, they correspond to the No and Yes settings of the Include Details fields which are features of the Query Events and View Events commands.

The following sample Event Records do not reflect actual signal activity. Accordingly, the data should not be taken too literally. The sequence of events would not normally occur at a crossing. The data is illustrative only for the purposes of explanation.

NO DETAILS

The one-line form is used to provide event information from a single input. Analog Input levels, Digital and Virtual Input status information is not listed in this format. Six sample records are shown in the following.

```
02:01:05.0  03/14/13  System Power          Power     OFF       S01
02:01:37.0  03/14/13  System Power          Power     ON        S01
08:05:55.2  03/14/13  Gate Up Ind           GateUp    On        D006
10:12:01.3  03/14/13  Island 1              Island 1  I1 Down   D003
00:05:00.2  03/15/13  Sntp Clock Sync       SntpSync  OFF       S04
10:00:55.4  03/15/13  Gate Delay            Timer16   Violate   T16  31.1s
```

Event Records with No Details

Time–The time the event was detected is indicated in military-style HH:MM:SS format. The time is identified to the nearest tenth of a second.

Date–The date the event was detected is indicated in MM/DD/YY format.

Input Name–The twenty-character Input Name identifies the input. An Input Name of Gate Up Ind is listed in the third sample record.

Input Identifier–The eight-character Input Identifier further identifies the input. The Identifier GateUp is listed in the third sample record.

Event Name–The Event Name identifies the type of event detected at the input. The Event Name listed will always be a member of the Event Name pair assigned to the input. The Event Name I1 Down listed in the fourth Event Record clearly indicates to the user the type of event that was recorded.

Input Number–The Input Number is frequently, but not always, the last data field listed. The record may be from a Digital (D001 through D999), Analog (A01 through A04), Virtual (V01 through V08), Timer (T01 through T16) or System Event (S01 through S06).

4

Measured Time–Some Event Records will include a data field after the Input Number. Timer Inputs will include a measured duration. The last sample record includes a measured value.

The first two sample records are from System Input 1 (i.e., S1). The records indicate when power was lost and then restored to the logger. During the 32-second-long interval no events could be detected or recorded.

INCLUDE DETAILS

The two-line form is used to provide additional input information. The first line is formatted identically to that used by the No Details option. Refer to the section entitled "No Details" on page 43. The following sample record is the third Event Record from the previous section.

```
08:05:55.2  03/14/13  Gate Up Ind           GateUp    On        D006
x....X.... .......... ..x..... 12.9Vdc  13.4Vdc   0.0Vdc   0.0Vdc
```

Event Records with All Details

The left end of the second line of text is used to indicate the state of each Digital Input, in a group of 20, at the time the event was recorded. A pattern of x and . (period) characters are shown in the sample record. The left-most character, in the first group of ten, indicates the state of Digital Input D1. The right-most character, in the second group of ten, indicates the state of Digital Input D20. There are four symbols used to indicate the state of Digital Inputs. They are described in the section entitled "Symbol Legend" on page 45.

The middle section of the second line of text includes a sequence of eight characters that indicate the state of each Virtual Input at the time the event was recorded. A pattern of x and . (period) characters are shown in the sample record. The left-most character, in the group of eight, indicates the state of Virtual Input V1. The right-most character indicates the state of Virtual Input V8. There are four symbols used to indicate the state of Virtual Inputs. They are described in the section entitled "Symbol Legend" on page 45.

Finally, the second line of text also lists the measured levels of each Analog Input. From left to right, A1 through A4 are reported. The units of measurement are always displayed to the right of the measured level (e.g., Vdc and Vac). To the right of the units of measurement data is a single-character indicator. It is used to indicate the state of the Analog Input relative to the user-defined Limit Values. There are four symbols used to indicate the state of Analog Inputs. They are described in the section entitled "Symbol Legend" on page 45.

SYMBOL LEGEND

The four symbols used to indicate the state of Digital and Virtual Inputs are described in the following table.

Symbol		Definition
X	Upper-case X	The input has transitioned into its On state. The referenced input is the source of the Event Record. The assigned On Event Name is listed as the Event Name.
x	Lower-case x	The input remains in its On state. The referenced input is not the source of the Event Record.
:	Colon	The input has transitioned into its Off state. The referenced input is the source of the Event Record. The assigned Off Event Name is listed as the Event Name.
.	Period	The input remains in its Off state. The referenced input is not the source of the Event Record.

Table 6: Symbol Legend - Digital and Virtual Inputs

The four symbols used to indicate the state of an Analog Input are described in the following table.

Symbol		Definition
*	Asterisk	The input has transitioned into its unacceptable range of operation. The referenced input is the source of the Event Record. The assigned On Event Name is listed as the Event Name.
!	Exclamation mark	The input remains in its unacceptable range of operation. The referenced input is not the source of the Event Record.
=	Equal sign	The input has transitioned into its acceptable range of operation. The referenced input is the source of the Event Record. The assigned Off Event Name is listed as the Event Name.
	(blank)	The input remains in its acceptable range of operation. The referenced input is not the source of the Event Record.

Table 7: Symbol Legend - Analog Inputs

Event Names and Analog Limit Values are described in the sections entitled "Event Names (E)" on page 28 and "High and Low Limits" on page 25, respectively.

CSV REPORT TYPE

The Query Events command provides an additional formatting option that can be selected by setting the Report Type to Comma. This section includes a description of a typical Comma Separated Value (CSV) report.

CSV SAMPLE REPORT

Listed in the following is a typical response to the Query Events command when the Report Type is set to Comma. Several of the sample records from the previous section have been used in the following.

```
22:39:46,03/15/13
"COVINA_ARROWGRAND9.7"
0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
```

CSV INPUT NUMBERS

The Input Number listed in a CSV record does not include the normal single-letter prefix (i.e., D, A, V, T and S). Instead they are assigned purely numerical values in sequential order. Table 8 on page 47 cross references Input Numbers and CSV inputs. The S-prefix is used to refer to System Events. They are described in the section entitled "System Events" on page 79.

Event Record Category	Input Number	CSV Input
Digital	D1-D999	1-999
Analog	A1-A4	1000-1003
Virtual	V1-V8	1004-1011
Timer	T1-T16	1012-1027
System Power	S1	1028
High Temperature	S2	1029
Low Temperature	S3	1030
SNTP Clock Sync	S4	1031
GPS Clock Sync-correction > 5seconds	S5	1032
GPS Clock Sync-periodic interval	S6	1033

Table 8: CSV Input Numbers

CAPTURING EVENT RECORDS TO A PC FILE

The Query (with the Report Type set to Dump or Comma) and View commands will automatically stream Event Records to the active user port. A PC running HyperTerminal can be used to capture these records as a text file. The .txt file that is created can then be read using any commonly available word processing application (e.g., Notepad® or Word®). The steps necessary to capture the Event Records as a .txt file are listed in the following. HyperTerminal and Windows 7® were used in the following procedure. Later versions of these programs may be slightly different. However, the fundamental approach will remain valid.

1. Configure the various fields of the Query or View command as desired.

Perform steps 2 through 5 IMMEDIATELY BEFORE pressing the **F1** function key.

2. With the mouse, click on the Transfers command, then the Capture Text... command. The Capture Text dialog box will open.
3. Click the Browse button. The Select Capture File dialog box will be displayed.
4. Navigate to or create the desired folder that will contain the .txt file. Enter a filename (e.g., 02-20-14 0915AM). The three-character .txt file extension will be appended automatically. Click the Save button. The user will be returned to the Capture Text dialog box.
5. Verify that the file specification box lists the correct folder and filename. Click the Start button to open the .txt file.
6. Press the **F1** function key to initiate the data transfer. The logger will proceed to stream Event Records to the newly created .txt file.
7. In the case of the Query command the record stream will cease automatically when the last record is displayed. A record count and checksum will note the end of the data. Refer to the sample data entitled "Record Count and Checksum" on page 41. In the case of the View command the record stream will cease only when the user presses the **Esc** key.
8. With the mouse, click on the Transfers command, then the Capture Text... command. Click the Stop option that is displayed.

The .txt file is now closed and available for viewing. To read the file, navigate to the folder. With the mouse, double-click the filename (e.g., 03-14-13 0915AM.txt). The file will open in the default word processing application.

This concludes the chapter on how to operate the VDL from the four peripheral ports. Terminate the current session by using the Log Off command. Refer to the section entitled "Log Off (X)" on page 36.

The next chapter describes the use of the USB Host Port, front panel keypad and LCD.

Chapter 5 – Front Panel Operation

Introduction

The VDL S7-300 is designed to provide its user with the greatest degree of versatility and functionality. All MICRO-AIDE Event Recorders and Data Loggers come equipped with a front panel mounted Liquid Crystal Display (LCD) and keypad. Together these features allow the user to perform all of the setup and operational procedures required to effectively use the device. The advantage to the user is that a PC, although helpful, is not required to operate the logger.

Setup and operation of the VDL from the front panel is somewhat different than operation via a PC. The tasks to be performed and the end results are identical but the methods employed are different. This chapter describes the methods that are unique to front panel operation. Figure 1 on page 8 provides an illustration of the LCD panel and keypad.

Front Panel Description

USB Host Port

The front panel of the VDL includes a USB Type-A female connector. The connector is labeled "Save-USB Flash Drive". It is also illustrated in Figure 1 on page 8. Any USB flash drive can be connected to the port. Once connected, the flash drive can be used to save copies of selected Event Records. The procedure for doing so is described in "How to Use the USB Host Port" on page 50. The saved record files can then be read using any word processing application. Table 14 on page 87 lists the bit transfer rates of each user-accessible port including the USB Host Port.

Liquid Crystal Display

The LCD panel consists of a display approximately 3" by 1" in size. It is configured to present four lines of data. Each line can contain twenty alphanumeric characters and symbols. The LCD characters are large and can be viewed easily from several feet away. The super-twist design of the LCD panel provides a viewing angle of ±20° from the level of the display. The contrast level of the display may be adjusted. This can be helpful when the logger is exposed to very hot or cold temperatures. The single-turn potentiometer that controls the contrast level is accessible through a small hole in the front panel of the logger. It is labeled "Adj". Use a small flat-head screwdriver to adjust the setting.

Keypad

The keypad contains twenty individual keys. Each key consists of a pushbutton switch. They are clearly labeled as to their various functions. The keys are spaced .65" apart to minimize double hits. A special editing technique allows alphabetic characters to be entered via the keypad. The directional (▲, ▼, ◄, ►) and *Enter* keys also provide for quick menu item selection. Except while selecting a command or performing the special editing procedure, the left arrow key may be used to backspace over characters when an incorrect number has been entered.

Unless otherwise stated, characters shown in italics are used to refer to specific keys on the keypad (e.g., *Browse*). This convention is used throughout the remainder of this chapter.

LED INDICATORS

The front panel of the VDL also includes three LED indicators. The LEDs are used to provide immediate information about activity on various ports of the logger. The operation of each LED is described in the following.

- Power: The green LED illuminates when power is applied to the logger.
- Terminal: The green LED flashes momentarily whenever data is being sent or received via the Terminal Port.
- Modem: The green LED flashes momentarily whenever data is being sent or received via the optional modem.

HOW TO USE THE USB HOST PORT

Every VDL is equipped with a USB Host Port designed for use with a FAT-32 formatted flash drive. The port can be used to save copies of selected Event Records to a compact, portable memory. Once saved, the resultant text records can be read and reviewed on any PC. They can also be copied or moved to a PC file on a hard drive. As a further convenience, MICRO-AIDE's GEA software can be used to view or plot the records.

Saving records to a flash drive is completely non-destructive to the original records. Records can be saved as many times as desired by the user.

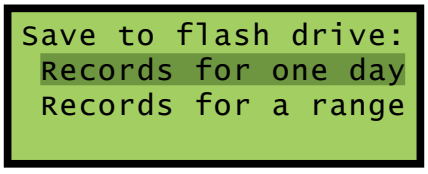
In the following illustrations the characters shown with a dark background indicate the initial position of the highlight and therefore, the presently selected command or option.

SAVING RECORDS TO A FLASH DRIVE

Either of two simple procedures can be used to save Event Records to a flash drive. Typically only a few front panel keystrokes are required. A PC is not required. Both procedures are described in the following.

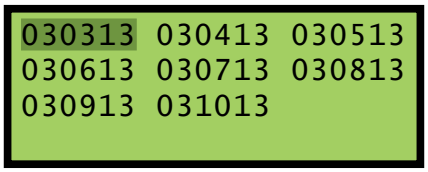
SAVING EVENT RECORDS FROM A COMPLETE DAY

1. Verify the USB flash drive is formatted FAT-32, not NTFS.
2. Insert the USB flash drive into the connector of the USB Host Port.
3. Press the ***Save/.*** key. The following message will be displayed.



Save Command

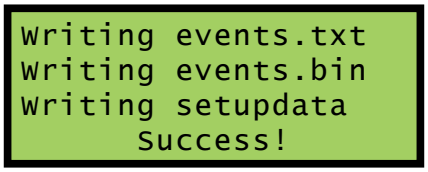
4. Press the ***Enter*** key after highlighting the Records for one day option.
5. A table of dates similar to the following will be displayed.



At least one Event Record will be logged for each date listed. Dates are listed in the MMDDYY format. The Event Records option may list as many as 128 dates. Only eight dates are listed in the example

cited previously. The up and down arrow keys can be used to scroll quickly through a large collection of dates.

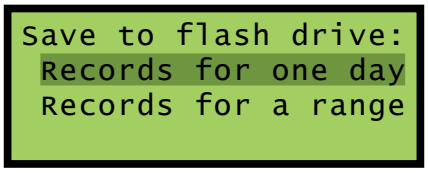
6. Press the *Enter* key after highlighting a date. The following message will be displayed briefly after the delay required to create the text file.



7. Records from additional complete days can be saved by repeating this procedure starting at step 3.
8. Remove the flash drive from the USB Host Port after all the required records have been saved.

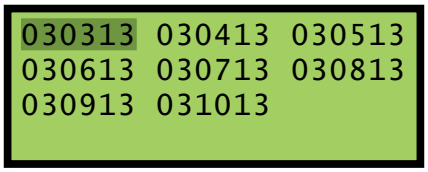
SAVING EVENT RECORDS FROM A RANGE OF TIMES AND DATES

1. Verify the USB flash drive is formatted FAT-32, not NTFS.
2. Insert the USB flash drive into the connector of the USB Host Port.
3. Press the *Save/.* key. The following message will be displayed.



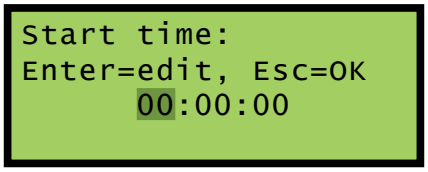
Save Command

4. Press the *Enter* key after highlighting the Records for a range option.
5. A table of dates similar to the following will be displayed. The dates represent the available start date of the range.



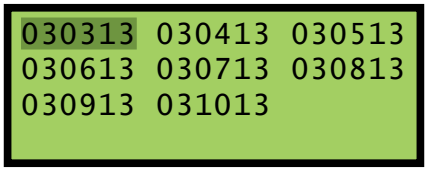
At least one Event Record will be logged for each date listed. Dates are listed in the MMDDYY format. The Event Records option may list as many as 128 dates. Only eight dates are listed in the example cited previously. The up and down arrow keys can be used to scroll quickly through a large collection of dates.

6. Press the *Enter* key after highlighting a date. The following message will be displayed.

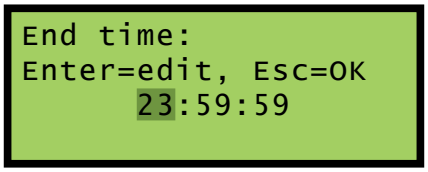


7. To accept the 00:00:00 midnight setting as the start time, press the *Esc* key. To modify the start time move the highlight to the hours, minutes or seconds position. Press the *Enter* key. Press the number keys as required to create a new value. The VDL utilizes a military-style clock. Accordingly, 12:01:02 AM is defined as 00:01:02 and 12:59:58 PM is defined as 23:59:58. Leading zeros are not required. To accept the new value, press the *Esc* key. Using the same technique, adjust the other values as required. When the start time is correct, press the *Esc* key.

8. A table of dates similar to the following will be displayed. The dates represent the available end date of the range.

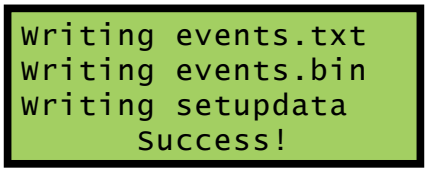


9. Press the *Enter* key after highlighting a date. The following message will be displayed.



10. To accept the 23:59:59 setting as the end time, press the *Esc* key. To modify the end time use the procedure described in step 6. When the end time is correct, press the *Esc* key.

11. The following message will be displayed briefly after the delay required to create the text file.



12. Records from other times and dates can be saved by repeating this procedure starting at step 3.

13. Remove the flash drive from the USB Host Port after all the required records have been saved.

5

FILES WRITTEN TO THE FLASH DRIVE

The first time Event Records are saved via the USB Host Port a folder is automatically written to the flash drive. The name of the folder is taken from the first twenty characters of the Unit Name. Certain restrictions apply to the creation of the Unit Name. Refer to the section entitled "Unit Name" on page 20 for additional details.

After the folder is created, three files are written within the folder. A description of each file is listed in the following sections. All of the record files from a specific logger will be written to the same folder. Provided the first twenty characters of the assigned Unit Name are not changed, a new folder is never created regardless of how many record files are saved from the logger.

EVENTS TEXT FILE

The first file written is the text version of the Event Records. The file is assigned a filename formatted as follows: MM-DD-YY@hhmmss-mmddyy.txt. As a text file, this file can be read by any word processing application (e.g., Notepad or Word). Table 9 on page 53 provides a complete description and example of the filename format.

Text and Binary Filename Definition	Description
MM-DD-YY	The date of the first record saved to the flash drive.
hhmmss	The time the records were saved to the flash drive.
mmddyy	The date the records were saved to the flash drive.
.txt	Denotes the file as a text file readable by any word processor.
.bin	Denotes the file as a binary file readable only by GEA.
Example: 03-04-13@120127-033013.txt	The first record is from 03-04-13. They were saved to the flash drive at 12:01:27 pm on 03-30-13.

Table 9: Flash Drive Filenames

EVENTS BINARY FILE

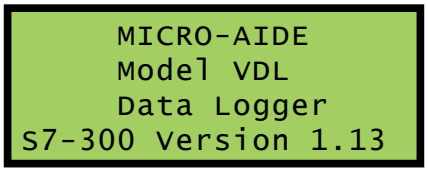
The selected Event Records are also written to the flash drive as a highly compressed binary file. The filename is formatted similarly to the text file; however, the file extension is changed to .bin. The binary version of the record file is used exclusively by GEA for viewing and plotting of the Event Records.

SETUP DATABASE BINARY FILE

In order for GEA to view and plot the saved records a copy of the logger's Setup Database must be available. The logger's database file is always named setupdata.bin. This file is automatically overwritten each time a record file is written to the flash drive.

HOW TO USE THE KEYPAD

After power is applied, the VDL will perform a firmware boot-up procedure. The LCD will remain blank for 10 to 15 seconds while the logger is booting. The following message will be briefly displayed at the completion of the boot-up procedure.

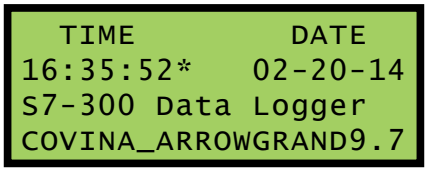


The reference to firmware version 1.13 may vary. The firmware version number should be recorded and saved in the event service ever needs to be performed on the unit. After the boot-up procedure is completed the logger will automatically enter Idle Mode. There are three operational modes, each is described in the following sections.

IDLE MODE

Except as noted in the following, the real-time clock and Unit Name are displayed during Idle Mode. It is the at rest condition of the logger. An example of the real-time clock display is shown in the following. The first twenty characters of the Unit Name are listed in the fourth row. Refer to the section entitled "Unit Name" on page 20 for additional information.

Throughout the remainder of this chapter, the characters shown with a dark background indicate the initial position of the highlight and therefore, the presently selected command or option.



LCD During Idle Mode

The VDL utilizes the 24-hour, military time convention (e.g., 7:00 PM is shown as 19:00:00). The date and time display is altered once every minute for five seconds. Alternating messages referring to the Setup and Browse Modes are displayed during this period.

An asterisk (*) to the right of the displayed time indicates that the optional GPS Receiver is locked onto a verified GPS signal.

The real-time clock display is also interrupted in Idle Mode when new Event Records are logged. Each new event will be displayed only briefly. This process is useful in verifying that the logger is continuing to detect events. The Event Record format used by the LCD is described in the following section.

Event Record Format

Event Records consist of four lines of text. Sample records for several input types are shown in the following.

```
08:05:55.2  03-14-13
D006     1x....x....
Gate Up Ind
GateUp      On
```

LCD Event Record - Digital Input

```
09:47:56.7  03-14-13
A01  10.1Vdc x...
BatteryBank1
BB1         Batt1BAD
```

LCD Event Record - Analog Input

```
19:55:44.7  03-14-13
V02      1.x......
Virtual Gate Up
VGateUp     On
```

LCD Event Record - Virtual Input

```
20:01:17.7  03-14-13
T16  15.9s
Switch_Delay_R127
R127-3      Violate
```

LCD Event Record - Timer Input

The first line of text always specifies the time and date the event was logged to memory. The date is listed in MM-DD-YY format.

The second line of text lists the Input Number. It is generally followed by a sequence of x and . (period) characters. An x indicates an input with an active or On Event state. A . (period) indicates an input with an inactive or Off Event state. In the case of Analog Inputs the state indicators are preceded by the measured Analog Input level (e.g., 10.1 Vdc in the second sample record). In the case of Digital Input records all 999 Digital Input states cannot be depicted in the second line of text. Only a group of ten are shown. The number that precedes the state field is the Input Number of the first state indicator. For Analog Inputs the state indicators, from left to right, pertain to A1 through A4. The Measured Time value is listed in the case of Timer Input records.

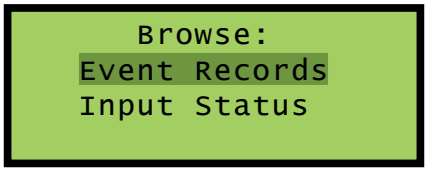
The third line always lists the twenty characters of the assigned Input Name (e.g., Gate Up Ind in the first sample record).

Finally, the eight characters of the assigned Input Identifier and Event Name are listed in the fourth line from left to right, respectively. Input Identifiers and Event Names are described in "Input Names/Identifiers (I)" on page 28 and "Event Names (E)" on page 28, respectively.

BROWSE MODE

Browse Mode is most commonly used to view Event Records via the LCD panel. Event Records may be viewed in either forward or reverse chronological order. Events are selected by date and time and optionally by Input Number. However, an additional feature allows the user to inspect the current status of an input.

To access any of the Browse options press the ***Browse*** key. The following message will appear.

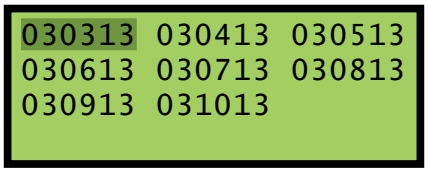


Browse Command

Both options are described in the sections that follow.

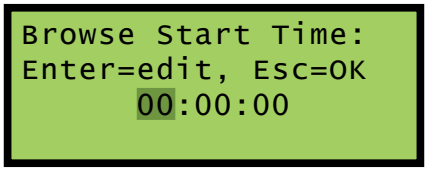
EVENT RECORDS

After selecting the Event Records option a table of dates similar to the following will be displayed.



Browse Command-Event Records Option

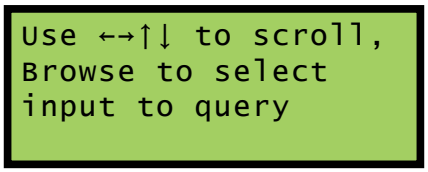
At least one Event Record will be logged for each date listed. Dates are listed in the MMDDYY format. The Event Records option may list as many as 128 dates. Only eight dates are listed in the example cited previously. The up and down arrow keys can be used to scroll quickly through a large collection of dates. Press the ***Enter*** key after highlighting a date. The display will then specify a start time as shown in the following.



Press the ***Esc*** key if records starting from midnight are to be inspected. To inspect records starting later in the day perform the following steps.

1. Using the left and right arrow keys position the highlight in the hour, minute or second field.
2. Press the ***Enter*** key to select the highlighted field.
3. Enter the required hours, minutes or seconds by pressing the appropriate numeric keys. Leading zeros are not required.
4. Press the ***Enter*** key to complete the entry.
5. Repeat the previous steps to adjust the remaining fields.

After the correct starting time is specified the ***Esc*** key should be pressed. The following message describing the use of the arrow keys will be briefly displayed.



Provided the ***Browse*** key has not been pressed, the first Event Record meeting the specified date and time criteria will be displayed. Refer to the section entitled "Event Record Format" on page 54. The left and right arrow keys can be used to review Event Records in forward or reverse chronological order.

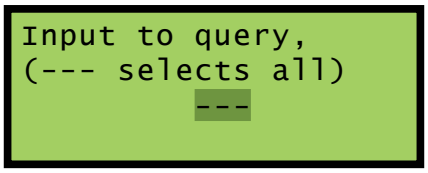
Holding down an arrow key allows the user to search through the record set very quickly.

The limits of the record set will be indicated by a message stating either Start of Data or End of Data. To exit Browse Mode and return to Idle Mode press the ***Esc*** key.

Press the ***Browse*** key any time after the start time is specified to inspect records for a particular input. This procedure is referred to as Query by Input Number.

QUERY BY INPUT NUMBER

To inspect Event Records for a specific input press the ***Browse*** key after the starting time is specified. The following message will be displayed.



A flashing highlight will be positioned in the Input Number field located in the third row of text. To specify an input follow the steps listed in the following.

1. Press the ***Alpha*** key repeatedly until the desired input type (i.e., D, A, V, T or S) is displayed.
2. Press the appropriate number keys to enter the Input Number. Leading zeros are not required.
3. Press the ***Enter*** key to display the first Event Record satisfying the date, time and Input Number criteria. Several seconds may be required to locate the first record.
4. Use the arrow keys to inspect additional records for the specified input.

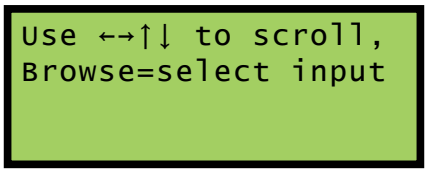
The ***Browse*** key can be pressed again at any time if a different input is to be inspected. Press the ***Esc*** key to exit the Query by Input Number procedure and return to Idle Mode.

The VDL will log an Event Record to memory when the power is turned off as well as on. Additionally, a record will be logged if the measured temperature is outside the Temp Limits assigned by the user. These records are referred to as System Records and are associated with S-type inputs. Refer to the section entitled "System Events" on page 79 for additional details.

INPUT STATUS

The Input Status option allows the user to inspect the current state of each input. The status of Digital, Analog and Virtual Inputs is indicated by their assigned Event Names. Voltage measurements are reported for Analog Inputs. The Input Status feature can be of great use when setting up the logger. Without a peripheral device the user can verify that inputs are assigned proper Input Identifiers and Event Names. Each input can be checked to verify that it will report a change of state. Additionally, the command provides a DVM-like function for each Analog Input.

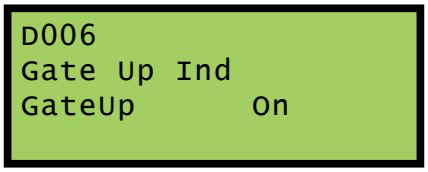
After selecting the Input Status option the following message will be displayed briefly.



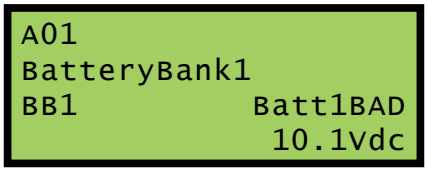
Browse Command-Input Status Option

The arrow keys can be used to scroll from one input to the next. Digital Inputs are followed by Analog Inputs. They are followed by Virtual Inputs. Rather than use the arrow keys to scroll sequentially through each input the user can jump to a specific input by pressing the ***Browse*** key. Select the input using the procedure described in "Query by Input Number" on page 56.

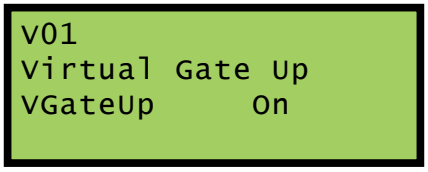
Sample status data for each input type is listed in the following.



LCD Input Status-Digital Input



LCD Input Status-Analog Input



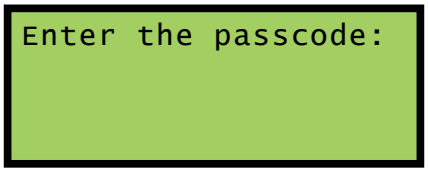
LCD Input Status-Virtual Input

The Input Number and Input Name are listed in the first and second rows, respectively. The Input Identifier and Event Name are listed in the third row. The fourth row is used to report analog levels. The data listed is updated automatically and in real-time. Without the aid of a PC the user can check the sequence of events at a crossing or while a control function is being exercised. Press the ***Esc*** key to exit the Input Status feature and return to Idle Mode.

SETUP MODE

Setup Mode allows the user to set up the VDL to a specific set of application requirements. The various commands that can be executed from the keypad form a subset of those performed via a peripheral device. Only a few commands are not applicable to the keypad (e.g., Transfer Files, Network). The results from any keypad-performed command are indistinguishable from those performed from a peripheral device. Accordingly, the setup descriptions that are a part of Chapter 3 may be used to provide a more detailed explanation of their keypad counterparts.

To enter Setup Mode from Idle Mode press the ***Setup*** key. The following message will be displayed. The user must enter the correct Passcode before any setup command can be executed.

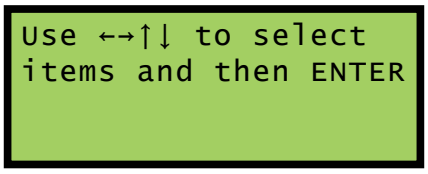


Passcode Request

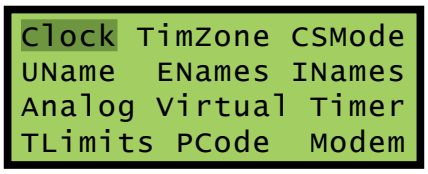
The factory default Passcode is *12345678*.

Passcodes are assigned numeric values only. Press the ***Enter*** key to complete the entry. If the user fails to enter the correct Passcode an error message will be displayed.

Assuming the correct Passcode is entered the following message will be briefly displayed.

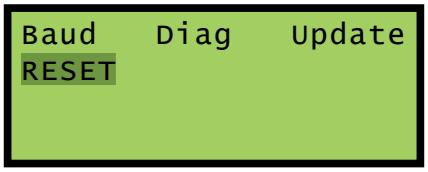


The Setup Menu of front-panel-accessible commands will then be displayed as shown in the following.



LCD Setup Commands - Screen 1

Moving the highlight beyond the limits of the first menu will display the following additional commands.



LCD Setup Commands - Screen 2

5

The Setup Menu consists of twenty commands. Table 10 on page 58 provides a brief explanation of each command. To select a command advance the highlight to the desired command and press the ***Enter*** key. The use of each command is explained in the final sections of this chapter.

Name	Description
Clock	Set date and time
TimZone	Select Time Zone and enable / disable Daylight Saving Time
CSMode	Select Clock Sync Mode
UName	Assign Unit Name
ENames	Assign Event Name pairs
INames	Assign Input Names, Identifiers and Event Name pair number
Analog	Configure Analog Inputs
Virtual	Configure Virtual Inputs
Timer	Configure Timer Inputs
TLimits	Assign High and Low Temperature Limits
PCode	Assign Passcode
Modem	Assign Ring Count and Dial Numbers
Baud	Select Terminal Port and Vital-Processor Port Baud rates
Diag	Perform system diagnostics
Update	Update firmware from USB Host Port
RESET	Erase all Event Records Restore Setup Database to factory default values

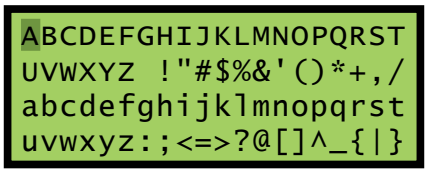
Table 10: List of LCD Setup Commands

Before proceeding the user should note that several of the commands require alphabetic characters to be used in the creation of a name or label (e.g., Input Name). The keypad, however, contains only numeric and function keys. A special Alphanumeric Editing Procedure which is a feature of all MICRO-AIDE Event Recorders and Data Loggers allows the user to create names and labels from an extensive set of characters. This procedure is described in the following.

ALPHANUMERIC EDITING PROCEDURE

The first step in the Alphanumeric Editing Procedure is to select the parameter that is to be edited (e.g., Input Name or Input Identifier). A flashing highlight is used to indicate a specific parameter. To select the highlighted parameter press the ***Enter*** key. A blank field of characters will be displayed. An underscore (i.e., _) will be positioned in the first character location. The underscore character is used as a cursor in the Alphanumeric Editing Procedure. The left and right arrow keys can be used at any time to position the cursor as required. To create an alphanumeric name perform the following steps.

1. Press the ***Alpha*** key. The following list of characters will be displayed.



Alphanumeric Characters

2. Using the arrow keys reposition the highlight until the desired character is highlighted. A total of eighty characters plus ten numbers are available for selection.

3. Press the ***Enter*** key to select the highlighted character. The selected character is placed into the name at the present location of the cursor. The cursor is then automatically moved one position to the right.

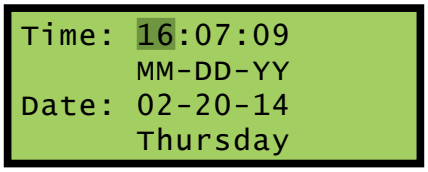
4. To enter a number into the name press the appropriate number key. To correct an error reposition the cursor under the character in error and overwrite it with a new character. To insert a space, assuming no characters have been inserted to the right, simply move the cursor to the right. The space characters follow the upper-case Z in the character set.

5. Repeat the previous steps until the name is completed.

6. Press the ***Enter*** key to accept the newly defined name. Alternatively, press the ***Esc*** key to retain the previously assigned name or to start again by ignoring all of the character entries.

CLOCK

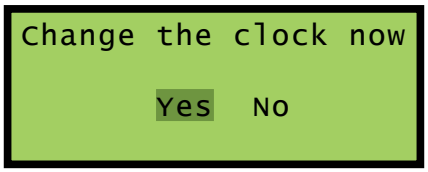
The Clock command is used to change the date or time. The time is always listed in 24-hour, military-style format (e.g., 7:00 PM is listed as 19:00:00). In accordance with this convention the user must enter the time by using the same format. The date is always listed in MM-DD-YY format as shown in the following.



Clock Command

To change the date or time position the highlight in one of the numeric fields. Press the ***Enter*** key. Enter a valid one- or two-digit number (leading zeros are not required). Press the ***Enter*** key to accept the new value. Adjust the other fields as required. The day of week is automatically calculated by the VDL based upon the day, month and year selected by the user.

Press the ***Esc*** key after the changes have been made. The following message will be displayed.

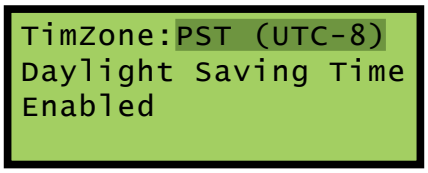


To complete the command, select the desired option and then press the *Enter* key.

The clock of the VDL can be precisely synchronized using either of three different methods. The Clock Sync Mode can be set to SNTP or GPS. The logger supports SNTP-Unicast and SNTP-Multicast time syncing. Refer to the section entitled "CSMode" on page 60. If the clock cannot be synchronized MICRO-AIDE recommends that the clock be manually set once per month.

TIMZONE

The TimZone command is used to assign the Time Zone and control the Daylight Saving Time (DST) setting. A message similar to the following will be displayed after selecting the TimZone command.



Time Zone Command

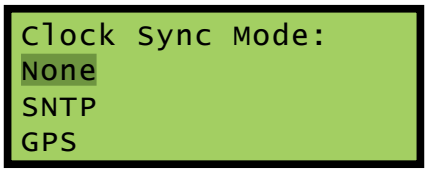
The highlight will initially be placed in the TimZone field (e.g., PST (UTC-8) in the example cited previously). To select a new Time Zone setting press the *Enter* key repeatedly until the correct setting is displayed. There are seven Time Zone settings. They are listed in Table 4 on page 24.

To enable or disable the automatic adjustment for DST, position the highlight in the third row. Press the *Enter* key to change the current setting.

Press the *Esc* key to accept the current settings and complete the command.

CSMODE

Three different methods can be used to synchronize the logger's real-time clock. The Clock Sync Mode command allows the user to select either SNTP or GPS. The following message will be displayed after selecting the CSMode command.



Clock Sync Mode Command

Listed in the following are usage instructions regarding the three methods that can be used to synchronize the logger's clock.

None–The real-time clock is not synchronized.

SNTP-Unicast–The Clock Sync Mode must be set to SNTP. A time server on the LAN must be accessible to the logger via its Ethernet Port. The time server must support SNTP-Unicast. The SNTP Server parameter must be set to the IP address of the time server. The SNTP Server IP address is assigned by the System Parameters command. Refer to the section entitled "SNTP Server" on page 23 for additional details.

SNTP-Multicast–The Clock Sync Mode must be set to SNTP. A time server on the LAN must be accessible to the logger via its Ethernet Port. The time server must be enabled for SNTP-Multicast operation. The SNTP

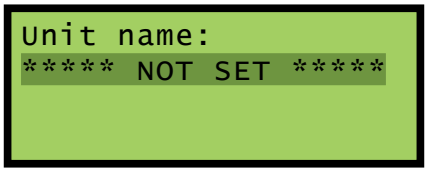
Server parameter must be set to 0.0.0.0. The SNTP Server IP address is assigned by the System Parameters command. Refer to the section entitled "SNTP Server" on page 23 for additional details.

GPS–The optional GPS Receiver must be installed and it must acquire a valid GPS signal. Provided these conditions are met, the GPS signal becomes the synchronizing source. Once an hour the clock is synchronized.

Setting the SNTP Server IP address to 0.0.0.0 automatically disables Unicast operation in favor of Multicast. Conversely, a non-zero IP address disables Multicast operation in favor of Unicast. However, for proper operation all of the other conditions described previously must be met.

UNAME

The UName command is used to assign a unique name to each Data Logger. The first twenty characters of the Unit Name must be assigned in accordance with various rules. These are described in the section entitled "Unit Name" on page 20. A message similar to the following will be displayed after selecting the UName command.



Unit Name Command

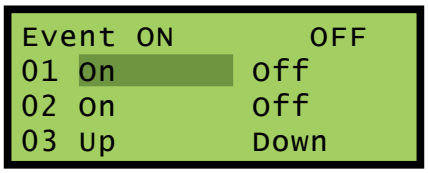
The first twenty characters of the existing Unit Name are displayed in the second line of text. The default Unit Name is displayed in the sample data cited previously. To change the name press the ***Enter*** key. Assign a new name or modify the existing name by using the "Alphanumeric Editing Procedure" on page 59. Press the ***Esc*** key to complete the command.

Due to restrictions in the size of the LCD panel the UName command can be used to assign a Unit Name limited in length to twenty characters. Lengthier Unit Names (up to eighty characters) must be assigned by using the System Parameters command.

ENAMES

Event Names are created by the user to uniquely identify Event Records. By way of example, the state of an input can be labeled as "Up" or "Down" or "GateUp" or "GateDwn". Event Names add clarity to Event Records that would otherwise not be possible if input states were only labeled as "On" or "Off". Event Names are always assigned in pairs to identify the active and inactive state of an input. As many as twenty Event Name pairs can be assigned. Refer to the section entitled "Event Names (E)" on page 28 for additional details.

Data similar to the following will be displayed after selecting the ENames command.



Event Names Command

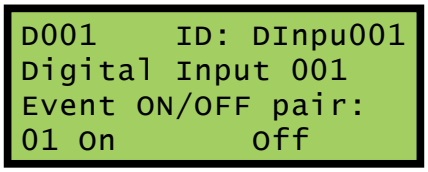
Three Event Name pairs are displayed at one time. The number (i.e., 1 to 20) of the pair is listed at the start of each row. It is followed by the currently assigned active or On Event Name (e.g., Up) and the existing inactive or Off Event Name (e.g., Down). To create a new name or modify an existing name select the Event Name pair by pressing the up or down arrow keys to advance through the list of twenty pairs. Use the left and right arrow keys to select either the on or off field. Press the ***Enter*** key. A blank field with a cursor in the left-most position will be displayed. Use the "Alphanumeric Editing Procedure" on page 59 to create a new name. Use the same procedure to modify additional names.

After all of the Event Name pairs are defined press the ***Esc*** key to complete the command.

INAMES

The INames command is a multi-purpose command that allows the user to assign Input Identifiers, Input Names and Event Name pairs to each input of the logger. Input Identifiers and Input Names allow the user to interpret Event Records more precisely by referring to inputs with labels that are unambiguous (e.g., Track_Switch_Control vs. Digital Input 20). Refer to the section entitled "Input Names / Identifiers (I)" on page 28 for additional details.

Data similar to the following will be displayed after selecting the INames command. In all cases default values are assigned.



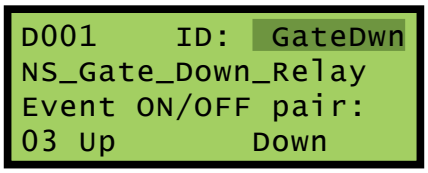
Input Names Command

The Input Number is always displayed in the upper left-most corner. To select a different input press the up or down arrow keys repeatedly. Alternatively, press the ***Browse*** key to jump to a different input. Press the ***Alpha*** key repeatedly until the desired input type is displayed (i.e., D, A, V or T). Enter an Input Number by pressing the appropriate number keys. Leading zeros are not required. Press the ***Enter*** key to jump directly to the selected input.

The field labeled "ID" will initially be highlighted. Move the highlight to the second row to select the Input Name. Press the ***Enter*** key to modify the highlighted assignment. A blank field with a cursor in the left-most position will be displayed. Use the "Alphanumeric Editing Procedure" on page 59 to create a new Input Identifier or Input Name.

To assign an Event Name pair to a specific Input Number move the highlight to the fourth row. Press the ***Enter*** key repeatedly until the desired Event Name pair (i.e., 1 to 20) is displayed. Each time the ***Enter*** key is pressed the fourth line of text will be automatically updated to reflect the contents of the selected Event Name pair. Pressing the ***Enter*** key while pair number twenty is displayed will return the user to pair number one. After all of the names and pairs are assigned press the ***Esc*** key to complete the command.

In the following example the Input Name and Identifier have been assigned as NS_Gate_Down_Relay and GateDwn, respectively. Event Name pair number 3 states that an Event Name of Up will indicate an On Event. An Event Name of Down will indicate an Off Event.

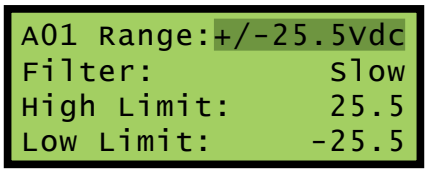


Input Name Command - Example

ANALOG

The Analog command is used to configure the four Analog Inputs of the VDL. Each Analog Input can be used to monitor AC or DC voltages. Like a DVM, the VDL can report its measurements using several different scales and resolutions. Analog Inputs that vary beyond an acceptable range of operation can be reported by setting appropriate Limit Values. Refer to the section entitled "High and Low Limits" on page 25 for additional details.

Data similar to the following will be displayed after selecting the Analog command.



Analog Command

The Analog Input number is displayed in the upper left-hand corner. To select a different Analog Input press the up or down arrow keys repeatedly. Alternatively, press the ***Browse*** key to jump to a different input. Specify the Input Number by pressing the appropriate numeric keys. Leading zeros are not required. Press the ***Enter*** key to jump directly to the selected input. The first row also indicates the Range setting. The Filter setting and High and Low Limit Values are listed in the remaining rows.

To change the Range setting, highlight the existing setting and press the ***Enter*** key until the desired Range is displayed. The sequence of possible Range settings is ±25.5 Vdc, +51.1 Vdc, ±255 Vdc, 25.5 Vac, 255 Vac, ±25.5 Adc and 25.5 Aac.

The Filter setting controls the amount of smoothing the measured signal is subjected to. AC signals require the Slow setting to remove their ripple content. DC signals can generally use either the Slow or Fast setting. To toggle the existing setting simply press the ***Enter*** key.

All AC voltage and current measurements are reported in RMS units.

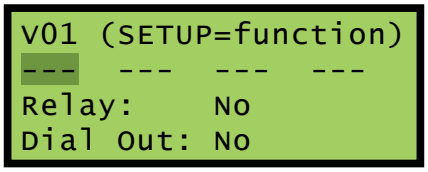
The Limit Values can be set separately. They cannot exceed the bounds of the Range setting. To change an existing setting highlight the value and press ***Enter***. Use the number keys to enter the new value. Enter fractional and negative values by using the decimal and minus keys, respectively.

After the new settings have been assigned press the ***Esc*** key to complete the command.

VIRTUAL

Virtual Inputs allow the VDL to identify and report a variety of signal conditions that may be of interest to the user. These conditions may refer to anomalies in the state of bit controlled relay circuits. High or low analog levels may also be of special concern to the user. The eight Virtual Inputs of the VDL are configured by use of the Virtual command. Refer to the section entitled "Virtual Inputs (V)" on page 29 for additional information.

Data similar to the following will be displayed after selecting the Virtual command.



Virtual Command

In the sample data cited previously, Virtual Input number 1 has not been assigned. It retains its default settings. The Virtual Input number is displayed in the upper left-most corner. To select a different Virtual Input press the up or down arrow keys repeatedly. Alternatively, press the ***Browse*** key to jump to a different input. Specify the Input Number by pressing the appropriate numeric keys. Leading zeros are not required. Press the ***Enter*** key to jump directly to the selected input.

The second line of text includes four place holders for variables. Variables are Digital, Analog, other Virtual or Timer Inputs. The procedure for assigning variables is described in the following.

Each Virtual Input can selectively operate the internal relay of the VDL. Press the ***Enter*** key to toggle the existing Relay setting from No to Yes or vice versa. Virtual Input records can be transmitted to a remote maintenance facility provided the VDL is equipped with an internal modem. Press the ***Enter*** key to toggle the existing Dial Out setting.

ASSIGNING VARIABLES

A variable can be any valid Digital, Analog, other Virtual or Timer Input. To assign variables complete the steps listed in the following.

1. Press the left and right arrow keys to locate the highlight in a place holder field.
2. Press the ***Enter*** key.
3. Press the ***Alpha*** key until the desired input type designator appears (i.e., D, A, V or T).
4. Enter the desired Input Number by pressing the appropriate number keys.
5. Accept the new entry by pressing the ***Enter*** key.
6. Repeat the preceding steps if additional variables are required.

The final step is to select the states that each variable assumes in defining a Virtual Input.

SELECTING STATES

A Virtual Input can be thought of as a logical relationship shared by one to four inputs. Accordingly, the state a Virtual Input assumes is dependent upon the state of each assigned variable. It follows that a Virtual Input dependent upon one variable is defined by a combination of two states. Two variables yield a combination of four states. Three variables yield eight states. Four variables yield sixteen states. Selecting states involves the assignment of a Virtual Input state for each combination of variable states.

Press the ***Setup*** key after all of the variables have been assigned. Data similar to the following will be displayed.

```
Virtual Output Funct
-----Inputs----- V03
D999 D007 A04  ---
Off  off  off  off 0
```

Virtual Command - Assigning States

For the sample data cited previously, three of four possible variables have been assigned to Virtual Input V3. The third line of text lists the assigned variables by Input Number. The fourth line of text lists a specific combination of states for the assigned variables. The right-most field indicates the state the Virtual Input assumes for the combination of variable states listed.

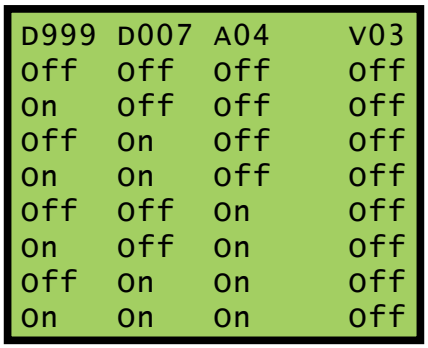
Variables (i.e., Digital, Analog, other Virtual and Timer Inputs) always assume either of two states. Each state is described in the following.

On–The Digital Input is defined as a logical 1 by the S7-300. The Analog Input level is outside its acceptable range as defined by its assigned Limit Values. Refer to Figure 3 on page 26. The Virtual Input evaluates to a true logic state. The Timer Input has measured a delay that is less than its assigned Low Limit Value or greater than its assigned High Limit Value.

Off–The Digital Input is defined as a logical 0 by the S7-300. The Analog Input level is within its acceptable range as defined by its assigned Limit Values. The Virtual Input evaluates to a false logic state. The Timer Input has measured a delay that is within the range of its assigned Limit Values.

The Virtual Input will assume the state defined by the setting in the lower right-hand corner. Press the ***Enter*** key to toggle the state of the Virtual Input from 0 to 1 (i.e., Off to On, respectively) or vice versa. This setting will apply only to the combination of variable states displayed in the fourth line. Press the down arrow key to define the Virtual Input state for the next combination of variables.

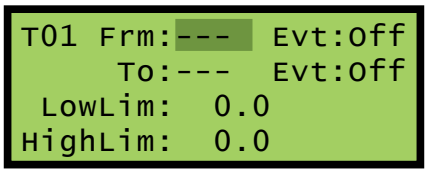
Listed in the following are the eight variable state combinations associated with the Virtual Input described previously. Each combination can be selected in the sequence listed by pressing the up or down arrow keys.



In the sample data cited previously, the state of the Virtual Input is set in all cases to its initial value of Off. Change the state of the Virtual Input as required by the remaining variable states. Press the ***Esc*** key to accept the new settings and complete the command.

TIMER

The VDL is equipped with sixteen general purpose Timer Inputs. Refer to the section entitled "Timer Inputs (W)" on page 26 for additional information. To configure a Timer Input via the front panel select the Timer LCD command. Data similar to the following will be displayed.



Timer Command

The presently selected Timer Input is always displayed in the upper-left corner (e.g., T01). To change the input press the up or down arrow keys repeatedly. Alternatively, jump to a specific input by pressing the ***Browse*** key and then the appropriate number keys. Complete the entry by pressing the ***Enter*** key.

To select the From and To Inputs move the highlight to the appropriate field and press the ***Enter*** key. Press the ***Alpha*** key repeatedly until the desired input type designator appears (i.e., D, A, V or T). Press the appropriate number keys. Complete the entry by pressing the ***Enter*** key.

Timer Inputs can be assigned as the From Input. This allows a Timer Input to trigger another Timer Input. However, a Timer Input cannot be assigned as the To Input.

Select the desired event setting by moving the highlight to the correct field and then pressing the ***Enter*** key. The current setting will be toggled between On and Off. Assign the High and Low Limit Values by locating the highlight as needed and pressing the ***Enter*** key. Press the appropriate number and/or decimal keys to assign a value. Complete the entry by pressing the ***Enter*** key.

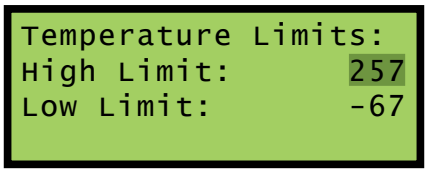
The Limit Values can be assigned in the range from 0.0 to 999.9 seconds.

Select another Timer Input and repeat the preceding steps as necessary. After all of the required Timer Inputs are configured terminate the command by pressing the ***Esc*** key.

TLIMITS

The TLimits command allows the user to assign a High and Low Limit against which the internal temperature of the logger is compared. If the temperature is found to be outside the acceptable limits of operation, a System Event Record will be logged to memory. A second record will be logged when the temperature recovers to a normal level.

Data similar to the following will be displayed after selecting the TLimits command.



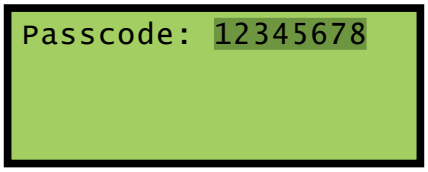
Temperature Limits Command

The default Limit Values are listed in the sample data. To change a Limit Value move the highlight to the appropriate field and press the ***Enter*** key. Enter a number using the number keys. Negative values can be entered. Accept the new value by pressing the ***Enter*** key.

The internal temperature and Limit Values are reported in degrees Fahrenheit.

PCODE

The Passcode feature prevents unauthorized users from altering the Setup Database via the front panel. Passcodes can contain any combination of numeric values not exceeding eight total. A message similar to the following will be displayed after selecting the PCode command.



Passcode Command

In the sample data cited previously the Passcode is set to its default value. To change the Passcode press the ***Enter*** key. A blank field with the cursor in the left-most position will be displayed. Assign a new Passcode by pressing the appropriate number keys. To assign a null Passcode press the ***Enter*** key instead. This will effectively disable the Passcode protection feature. Access to the logger will be permitted by simply pressing the ***Enter*** key when the request for Passcode message is displayed.

Accept the new Passcode by pressing ***Enter***. Press the ***Esc*** key to complete the command.

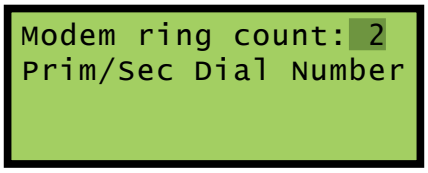
If the user forgets the assigned Passcode the System Parameters command should be executed. It will display the current Passcode assignment. Refer to the section entitled "Passcode" on page 22.

MODEM

The VDL can be equipped with an optional, internal 33,600 Baud modem. The modem option allows remote users to access the logger. Additionally, the modem's dial-out feature allows Event Records from Virtual Inputs to be transmitted to a remote maintenance center.

There are three parameters that control the operation of the modem. The Ring Count determines the number of rings that must occur prior to the modem answering an incoming call. The Primary and Secondary Dial Numbers identify the number to dial when attempting to transmit a Virtual Input record. Refer to the section entitled "Primary and Secondary Dial Numbers" on page 22 for additional information regarding these parameters.

Data similar to the following will be displayed after selecting the Modem command.



Modem Command

To change the Ring Count setting move the highlight to the appropriate field and press the ***Enter*** key. Enter a number in the range from 0 to 99. Accept the new value by pressing the ***Enter*** key.

A Ring Count setting of zero will prevent the modem from answering incoming calls.

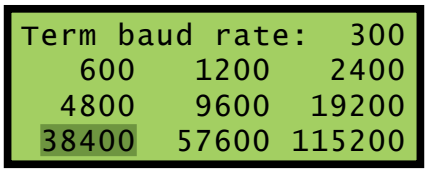
To assign a Primary or Secondary Dial Number move the highlight to the third or fourth row, respectively. The existing assignment will be highlighted. Press the ***Enter*** key. A blank field with the cursor in the left-most position will be displayed. Enter a valid dial number by pressing the appropriate number keys. The "Alphanumeric Editing Procedure" on page 59 can be used to insert non-numeric characters such as a comma to insert a two-second pause. Press the ***Enter*** key to accept the new assignment. Complete the command by pressing the ***Esc*** key.

BAUD

The Baud rate of the Terminal and Vital-Processor Ports can be changed by using the Baud command. The following menu is displayed after selecting the command.

Baud Command

To select the desired port move the highlight and press the ***Enter*** key. The following array of Baud rates will be displayed irrespective of the selected port.



List of Terminal and V-P Port Baud Rates

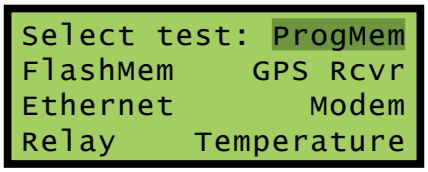
It is likely that the 38400 and 9600 settings will be highlighted as they are the default Baud rates for the Terminal and V-P Ports, respectively. To assign a new Baud rate move the highlight to the desired setting by pressing the arrow keys. Press the ***Enter*** key to accept the new selection. The Baud rate of the peripheral device attached to the Terminal and / or V-P Ports must be changed to match the new setting.

It is strongly recommended that the Baud rate of the Siemens S7-300 serial comm port be left at 9600. Slower rates may introduce slight delays in the time stamping of events. Higher rates may place an unnecessary processing load on the system.

DIAG

The Diag command can be used to test seven critical logger functions. Included are tests of the program memory, Event Record memory, internal relay, internal temperature and optional Ethernet Port, GPS Receiver and internal modem. Each test can be performed at any time and is completely non-destructive. The contents of the Setup Database and Event Record memories will remain unmodified.

The following data will be displayed after selecting the Diag command.



Diagnostics Command

The highlight will initially be positioned over the ProgMem field. To select a different test, position the highlight in the desired field. Press the ***Enter*** key to perform the test. Each test is described in the sections that follow.

PROGMEM

A checksum of the entire program memory will be calculated and displayed after a few seconds. The following example shows the results of a typical ProgMem test.

```
Program Memory
Checksum=19bb (GOOD)

Hit any key...
```

Program Memory Test

The labels GOOD or BAD will indicate the success of the test.

The reported checksum value will vary depending upon the version of the installed firmware.

FLASHMEM

The results of a typical FlashMem test are listed in the following.

```
Flash Memory:
4096K

Hit any key...
```

Flash Memory Test

The test verifies that the microprocessor can properly access the Event Record memory. The reference to 4096K (or optionally 8192K or 16384K) indicates the size in bytes of the memory device. A value of 0K indicates that a failure has been detected.

GPS RCVR

The GPS Rcvr test will check for the presence and operability of the optional GPS Receiver. A typical test result is displayed in the following.

```
GPS Rcvr Test: Okay
17:14:42.087 Valid
34.1043,-117.8784
Hit any key...
```

GPS Receiver Test

At the end of the first line either Okay or NONE will be reported. Okay indicates that the GPS Receiver is installed and the microprocessor is communicating with the receiver. NONE indicates that the receiver is either not installed or has experienced a severe failure.

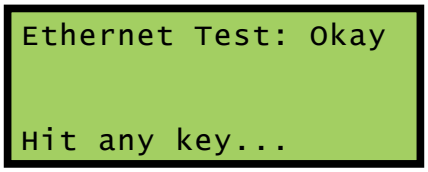
At the end of the second line either Valid or Invalid will be reported. Valid indicates that the GPS Receiver has achieved a signal lock with at least one satellite and that an accurate UTC-0 time is being reported. Invalid indicates that a satellite lock has not been achieved.

The third line will list the latitude and longitude coordinates if they are available. In order to report latitude and longitude the GPS Receiver must achieve a signal lock with a minimum of four satellites. Depending upon the location of the GPS antenna this may not be possible. In such cases coordinates of 0.0000,0.0000 will be listed.

Irrespective of the reported latitude and longitude coordinates, if the test reports Valid the GPS Receiver option is reporting accurate date and time data.

ETHERNET

The Ethernet test will verify that the microprocessor is able to communicate with the optional Ethernet Port. A typical test result is displayed in the following.



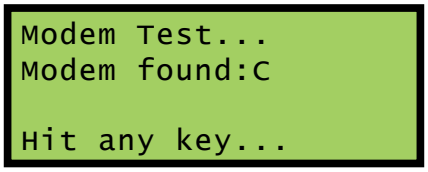
Ethernet Test

If the logger's microprocessor is able to communicate with the Ethernet Port, Okay will be reported. Otherwise, NONE will be reported.

The Ethernet test does not test for LAN communications. For this reason, MICRO-AIDE recommends that a ping test also be performed.

MODEM

Either of two results should normally be expected from the Modem test. The following response verifies that the optional modem is installed and that the microprocessor is able to communicate with the modem. A typical test takes a few seconds for the microprocessor to complete.

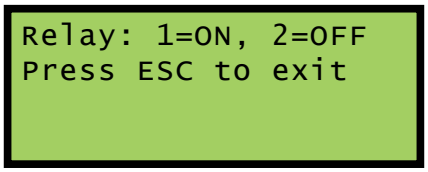


Modem Test

The C reference listed previously indicates that the VDL is equipped with a 33,600 Baud Silicon Labs modem. A "NONE" reference indicates that a modem is not installed or it has failed.

RELAY

The following message will be displayed after the Relay test is selected.

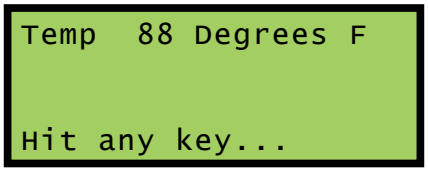


Relay Test

Press the *1* key to energize the selected relay. Press the *2* key to un-energize the relay. The relay and any circuitry attached to the relay contacts will be tested. Press the *Esc* key to complete the test. The relay will immediately reassume its previous state when the *Esc* key is pressed. Press any key to exit the test.

TEMPERATURE

The Temperature test reports the temperature inside the logger. A typical response follows.



Temperature Test

The temperature is always reported in degrees Fahrenheit.

The temperature reading should never exceed 180°F. The temperature inside the logger will generally be about 5°F to 10°F warmer than the surrounding ambient temperature.

The user may wish to contact MICRO-AIDE customer service if a failure occurs as the result of any diagnostic testing. Instructions on how to proceed will be offered. "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

UPDATE

The USB Host Port can be used to save a copy of selected Event Records in an easy-to-read text format. Refer to the section entitled "Saving Records to a Flash Drive" on page 50. The port can also be used to update the firmware used by the VDL. MICRO-AIDE will periodically make available to its customers new firmware that either expands or improves upon the capabilities of its products. The new firmware will be available for downloading from our website. Visit: http://micro-aide.com/support/downloads.htm. Once the appropriate firmware file is downloaded and unzipped it will yield a .hex file. This file can be saved to a flash drive and then later used to update the logger's firmware.

The USB Host Port cannot be used with NTFS formatted flash drives.

The USB Host Port operates in strict accordance with various Microsoft standards that apply to filenames and folders. Accordingly, the .hex file name must not be altered to include several illegal characters. All .hex files downloaded from the MICRO-AIDE website are, after they are unzipped, guaranteed to be compliant with applicable Microsoft and USB Host Port standards.

Occasionally a new firmware release will be incompatible with the logger's existing Setup Database. When this happens the existing database will have to be erased and a new one created. Incompatibilities, if any, are listed in Table 2 on page 5. It should always be reviewed before proceeding with an update.

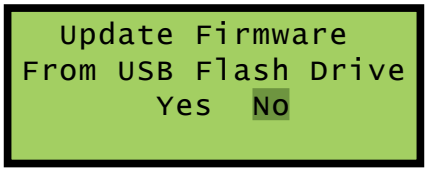
5

To update the firmware follow the steps listed in the following.

1. Verify the USB flash drive is formatted FAT-32, not NTFS.

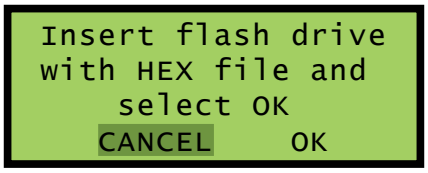
1. Insert the flash drive into the USB Host Port.

2. Select the Update command. The following message will be displayed.

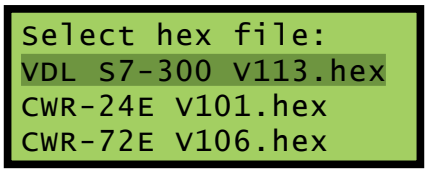


Update Command

3. Select the Yes option to proceed. The following message will be displayed.

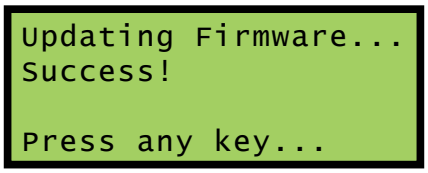


4. Select the OK option to proceed. Information similar to the following will be displayed.



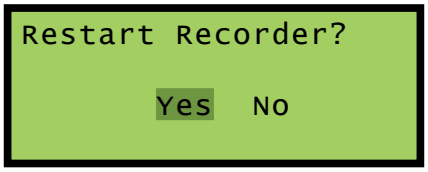
File Selection

5. The Update command allows the user to select a file from a list of nine. The first group of three are depicted in the example. To navigate to the second or third group, press the up or down arrow keys.
6. Once the correct file is highlighted, select it by pressing the ***Enter*** key.
7. The LCD will indicate that the new firmware file is being transferred. A single-line progress bar is used to indicate transfer activity. After approximately 30seconds the transfer will automatically terminate and the following message will be displayed.



Successful Update

8. Press the ***Esc*** key to proceed. Finally, the following message allows the user to run or ignore (refer to closing note) the new firmware. Select the Yes option to execute the new firmware by restarting the logger. The Update procedure has been completed.



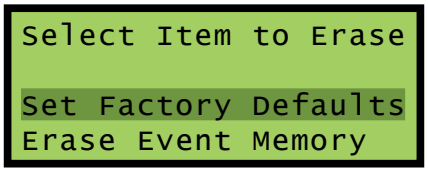
Restart Option

At the completion of the transfer, the new firmware is saved in the non-volatile memory of the logger. However, the new firmware is not executed until such time as a restart is performed. A restart can also be performed by simply cycling power to the logger.

RESET

The Reset command should be used with caution. It allows the user to selectively restore the entire Setup Database to its factory default values or to clear the Event Record memory. Refer to the section entitled "Reset System (R)" on page 18 for additional information.

The following message will be displayed after the Reset command is selected.



Reset Command

To restore the entire Setup Database to its default settings highlight the Set Factory Defaults field and press the ***Enter*** key. Select Yes to perform the reset or No to ignore the reset.

To completely erase all of the Event Records from the event memory highlight the Erase Event Memory field and press ***Enter***. Select Yes to perform the reset or No to ignore the reset.

It is important that the user not turn off power to the VDL for 60 seconds after initiating a reset of the Event Record memory.

This concludes the chapter on how to operate the logger from the front panel. Since the setup of the logger is critical to how the VDL will perform, it is advisable to review any changes that may have been made to the Setup Database.

The next chapter describes general maintenance techniques that may benefit the user in case a problem symptom is ever encountered.

Chapter 6 – Maintenance

Introduction

The primary purpose of this chapter is to describe the recommended trouble-shooting methods to be used with the VDL. It should be referred to if ever a questionable symptom arises during the operation of the Data logger.

The VDL is designed to provide its user with many years of trouble-free operation. There are no user serviceable parts inside the unit. There are no consumable items or supplies that need to be replaced or replenished. The user may occasionally need to wipe dust away from the external surfaces of the unit. This should be done with a clean, dry cloth. The mechanical design of the chassis provides the internal electronic assemblies with a nearly sealed environment. Due to the low power consumption of the unit ventilation holes are not required. The inside of the logger should remain clean indefinitely. Additionally, MICRO-AIDE printed circuit boards (PCBs) are sealed with a moisture and fungus resistant conformal coating.

Adjusting the LCD Contrast

The contrast level of the LCD panel may occasionally need to be adjusted to compensate for extreme variations in ambient temperature or viewing angle. To change the contrast level simply adjust the potentiometer labeled "Adj". It is accessible through a small hole in the front panel.

Working Inside the Data Logger

The user may have occasion to work inside the unit to add an optional equipment item. The following sections describe tasks involving work that may be performed inside the logger. Observe the steps listed in the following before attempting any task. Refer to Figure 1 on page 8 and Figure 2 on page 9. They illustrate the front and top sides of the logger, respectively.

1. Remove power from the logger by detaching the connector labeled "Power" located along the top side of the logger.
2. Remove the Analog and output Relay connectors and peripheral cables.
3. Remove the logger from the shelf or backboard.
4. Remove the four 6-32 1/4" screws from the top and bottom sides of the front assembly. The front and back portions of the logger can then be completely separated.

The task can now be performed safely. After the work is completed reassemble the logger by reversing the steps listed previously.

The Processor PCB is equipped with two potentiometers that are set and sealed at the factory. Do not attempt to alter these settings. Electrostatic discharges can cause serious damage to electronic components. When handling circuitry inside the logger it is recommended that the user wear a wrist grounding strap.

Replacing the Fuses

There are two fuses mounted on the Processor PCB. The fuses are designed to protect the input power source and the contacts of the output relay. Each are rated at 1 A and conform to the 2AG size standard. Before replacing a fuse the cause of the blown fuse should be ascertained and cleared if possible. The fuses are illustrated in Figure 5 on page 75.

Installing the Optional GPS Receiver

The VDL can be equipped with a GPS Receiver that is used to provide a 100% accurate, drift-free clock. Once installed and enabled the operation of the receiver is completely automatic. The GPS Receiver option is comprised of a small L-shaped PCB, plastic grommet and antenna.

Generally, the GPS Receiver is ordered at the time the logger is purchased and is pre-installed at the factory. If the receiver was not previously ordered, it can be installed by the user. To install the receiver follow the steps listed in the following. The GPS Receiver PCB is illustrated in Figure 5 on page 75.

1. Completely remove the logger's front panel assembly in accordance with the procedure entitled "Working Inside the Data Logger" on page 73.
2. The hole in the logger's top panel labeled "GPS Antenna" is capped with a plastic plug. Using a small screwdriver, carefully pry the plug off. Replace it with the plug that was shipped along with the GPS Receiver PCB. The new plug includes a hole and serves as an insulating grommet.
3. Locate the 6-pin female socket labeled "J10" near the top-right edge of the Processor PCB. The socket is illustrated in Figure 5 on page 75.
4. Carefully align the MCX connector with the top panel hole and the six pins on the GPS Receiver PCB with their socket counterparts. Press lightly on the edges of the PCB to insure it is seated properly and fully into the socket. The PCB should snap into place as it is secured by a pair of plastic stand-offs.

Do not, under any circumstances, press down on the center of the GPS Receiver PCB. Located in the center of the PCB is a metal encased component. The metal, if bent, can damage the electronic circuitry it protects. When installing the PCB snap it into place by pressing lightly and only along its edges.

5. Reassemble the logger.
6. The GPS antenna is housed inside a watertight enclosure at the end of a 16' long coax cable. Snap the cable end into the mating MCX connector located at the logger's top panel.
7. The antenna can be secured to any surface less than 3/8" in thickness. For best reception it is best to locate the antenna outdoors and pointed skyward.

After power is reapplied to the logger and the firmware is initialized, the Clock Sync Mode must be set to GPS. Refer to the section entitled "Clock Sync Mode" on page 22.

Installing the Optional Modem

The VDL can be equipped with a 33,600 Baud internal modem. The optional modem provides accessibility to remote users of the logger. Unlike commercially available external modems, the VDL modem will operate over the entire temperature range applicable to the logger. It uses the internal power of the VDL rather than commercial AC power.

Generally, the modem PCB is ordered at the time the logger is purchased and is pre-installed at the factory. If the modem was not previously ordered, it can be installed by the user. To install the modem follow the steps listed in the following. The modem is illustrated in Figure 5 on page 75.

1. Completely remove the logger's front panel assembly in accordance with the procedure entitled "Working Inside the Data Logger" on page 73.
2. Locate the 16-pin female socket labeled "J8" near the center of the Processor PCB. The socket is illustrated in Figure 5 on page 75.

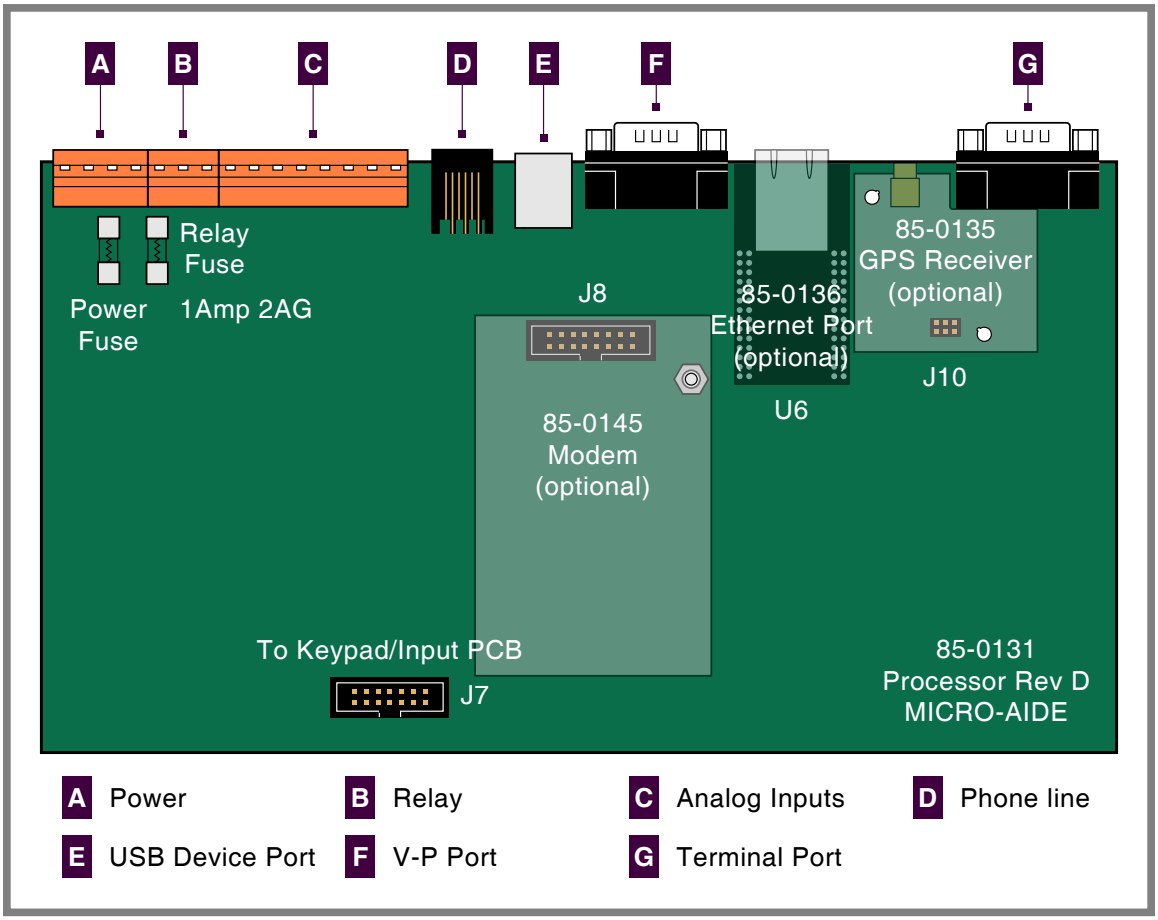


Figure 5: Processor PCB

3. Temporarily remove the 6-32 1/4" screw and lock washer secured to the hex stand-off located to the right of the socket.

4. Install the modem PCB by mating its sixteen-pin female connector with the Processor PCB socket. Use the 6-32 screw and lock washer to secure the modem to the hex stand-off.

5. Reassemble the logger.

When the VDL is reinitialized the firmware will automatically detect the modem's presence and configure it for auto-answer and originate operation.

INSTALLING THE OPTIONAL ETHERNET PORT

The VDL can be equipped with a 10/100 Base-T Ethernet Port. The optional Ethernet Port allows high speed local or remote access to the logger via a TCP/IP-based Local Area Network (LAN) connection. It uses the internal power of the VDL rather than commercial AC power. Table 14 on page 87 lists the bit transfer rates of each user accessible port.

Generally, the Ethernet Port is ordered at the time the logger is purchased and is pre-installed at the factory. If the port was not previously ordered the user may wish to install it after delivery of the logger. To install the Ethernet Port follow the steps listed below.

1. Completely remove the logger's front panel assembly in accordance with the procedure entitled "Working Inside the Data Logger" on page 73.

2. Remove and discard the protective plate that covers the Ethernet Port opening located at the top panel. A 6-32 1/4" nut secures the protective plate.

3. Locate the 56-pin female socket labeled "U6" along the upper edge of the Processor PCB. The socket is illustrated in Figure 5 on page 75.

4. Carefully align all of the pins on the Ethernet Port module with their socket counterparts. Press firmly on the module to insure it is seated properly and fully into the socket.

5. Reassemble the logger.

After power is reapplied to the logger and the firmware is initialized, the Ethernet Port must be properly configured. Refer to the procedure entitled "Network (N)" on page 31.

RECONNECTING THE INTERNAL CABLES

There are two ribbon cables inside the VDL. A fourteen-conductor cable is used to connect the Keypad/Input PCB to the Processor PCB. To reconnect the cable simply seat its end into its respective connector, labeled "J7". The connector end of each cable is keyed. Do not force the connector end into place. It should fit snugly but easily.

The second ribbon cable connects the Keypad/Input PCB to the LCD panel. It is easily damaged if improperly removed. Unless otherwise instructed by MICRO-AIDE service personnel, this cable should never be disconnected.

DIAGNOSTIC TESTING

The Main Menu of commands for the VDL includes the Diagnostics command. Refer to the sample data entitled "Main Menu" on page 15. The Diagnostics command can be used to quickly verify the operational integrity of several hardware elements of the VDL. Each of the eight tests can be performed at any time. They are non-destructive and therefore will not alter the contents of the Setup Database or Event Record memories.

The following menu of commands will be displayed in response to selecting the Diagnostics command.

```
System Diagnostics

C Checksum Test Program Memory
F Flash Memory Test
G GPS Receiver Test
E Ethernet Test
M Modem Test
K Keypad Test
R Relay Test
T Temperature
```

Diagnostics Command

Each command performs a specific test. The tests are described in the following sections.

CHECKSUM TEST PROGRAM MEMORY (C)

The Program Memory Test reads every memory address location used to store the program code. As part of the reading process a checksum is calculated and displayed at the completion of the test. The same checksum must be calculated each time the test is performed. Either GOOD or BAD will be reported at the completion of the test.

A typical response to the Program Memory Test is listed in the following.

```
Program Memory Checksum=19bb
                        GOOD

    Test Complete
Press any key to continue
```

Program Memory Test

The checksum takes only a few seconds to be calculated. The checksum value of 19bb in the previous example will vary with the version of the firmware installed in the logger.

FLASH MEMORY TEST (F)

The Flash Memory Test is performed on the memory chip used to store Event Records. The test verifies that the microprocessor can access the Event Record memory.

A typical response to the Flash Memory Test command is listed in the following.

```
Flash Memory1: 4096K


Test Complete
Press any key to continue
```

Flash Memory Test

If the logger has been equipped with larger amounts of Flash Memory the 4096K reference will be replaced by the references 8192K or 16384K. A failure has been detected if 0K is reported. The readings should be compared to the known memory capacity of the logger.

GPS RECEIVER TEST (G)

The GPS Receiver Test will check for the presence and operability of the optional GPS Receiver. The test will report several different messages depending upon the state of the receiver.

If the GPS Receiver has achieved a signal lock with at least four satellites, valid UTC-0 time and latitude and longitude coordinates similar to the following will be reported.

```
GPS Time: 20:42:57.068 is Valid
Location: 34.1044°, -117.8783°


Test Complete
Press any key to continue
```

GPS Receiver Test - Signal Acquired

A signal lock with one to three satellites allows the GPS Receiver to report a valid UTC-0 time. In such cases latitude and longitude coordinates of 0.0000° will be reported. Irrespective of the reported latitude and longitude coordinates, if the test reports Valid the GPS Receiver option is reporting an accurate UTC-0 time.

If the GPS Receiver is installed but has not as yet achieved, or is unable to achieve, a signal lock with any satellite, the following will be reported.

```
GPS Time: 23:59:44.000 is Not Valid
Location: 0.0000°, 0.0000°

Test Complete
Press any key to continue
```

GPS Receiver Test - Signal Not Acquired

If the GPS Receiver has failed completely or is not installed the following message will be reported.

```
GPS Receiver not installed


Test Complete
Press any key to continue
```

GPS Receiver Test - Not Installed

ETHERNET TEST (E)

The Ethernet Test can be performed at any time to verify that the microprocessor can communicate properly with the Ethernet Port. The test can be performed while the port is active or idle.

Assuming the Ethernet Port is operating properly, the following message will be reported.

```
Ethernet Okay


Test Complete
Press any key to continue
```

Ethernet Test

Okay is used to indicate a successful test. Not installed is used to indicate a failure.

The Ethernet Test does not test for LAN communications. For this reason, MICRO-AIDE recommends that a ping test also be performed.

MODEM TEST (M)

The Modem Test can be performed at any time to verify that the microprocessor can communicate properly with the internal modem. The test can be performed while the modem is idle or while a call is active.

Assuming that a modem is installed and it is operating properly the following message will be reported.

```
Modem Test in progress...
Modem found: C

Test Complete
Press any key to continue
```

Modem Test

The C reference indicates that a Silicon Labs modem is installed. If a modem is installed but NONE is indicated, a problem has occurred and must be corrected.

KEYPAD TEST (K)

Each of the twenty keys that comprise the front panel keypad can be checked by using the Keypad Test. The following instructions are displayed after selecting the command.

```
Keypad test, press ESC to cancel
```

Keypad Test

A single unique character is displayed in response to pressing a key. The correspondence between non-numeric keys and displayed characters is listed in Table 11 on page 78.

Key	Browse	Alpha	Setup	Esc	Enter	Save/.	▲	▼/-	◄	►
Displayed	B	A	S	E	N	.	^	v	<	>

Table 11: Keypad Test Characters

To exit the test, press the **Esc** key located at the keyboard of the peripheral device that is communicating with the VDL.

RELAY TEST (R)

The Relay Test allows the user to verify the operation of the internal relay and any alarm or indication circuitry connected to the contacts of the relay.

The following message will be displayed in response to the Relay Test command. Press the appropriate numeric key to change the state of the relay. To energize the relay select the Relay ON option. To un-energize the relay select the Relay OFF option.

```
Relay Test

1 Relay ON
2 Relay OFF
```

Relay Test

To exit the test press the **Esc** key. The relay will automatically reassume its pre-test state.

TEMPERATURE (T)

The Temperature Test simply reports the temperature inside the logger.

A typical response to the Temperature Test command is listed in the following. The temperature is always reported in degrees Fahrenheit.

```
Unit Temperature  83 Degrees F


Test Complete
Press any key to continue
```

Temperature Test

The measured temperature inside the VDL will generally be 5°F to 10°F warmer than the surrounding ambient temperature. Temperature readings should never exceed 180°F.

The user may wish to contact MICRO-AIDE customer service if a failure occurs as the result of any diagnostic testing. Instructions on how to proceed will be offered. The MICRO-AIDE "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

6

SYSTEM EVENTS

Event Records are normally created by a change in state of an input. Exceptions to this rule concern the cycling of power to the logger and variations in the measured temperature.

Each time power to the VDL is turned on or off an event will be logged into memory. If the temperature transitions into or out of the acceptable range an event will also be logged. Additionally, each time the SNTP Clock Sync feature sets the logger's real-time clock an Event Record is logged. These events are classified as System Events. To distinguish them, the Input Number always includes an S-prefix (e.g., S01). Additionally, the Input Name, Identifier and Event Name fields within the record are uniquely labeled. They cannot be changed by the user. Table 12 on page 79 lists the various fields used by each System Event Record.

Input Number	Input Name	Identifier	Event Name Pair
S01	System Power	Power	ON / OFF
S02	High Temperature	HighTemp	ON / OFF
S03	Low Temperature	LowTemp	ON / OFF
S04	Sntp Clock Sync	SntpSync	OFF / OFF
S05	GPS 5 Sec Correction	GPS 5Sec	OFF / OFF
S06	GPS Clock Record	GPS Rec	OFF / OFF

Table 12: System Event Records - Assigned Labels

System Events can be reviewed using either of two formatting options. Record formats are described in the section entitled "Event Record Formatting" on page 43. Listed in the following are seven sample Event Records as they would appear at the PC. In the interest of simplicity only the single-line form is shown.

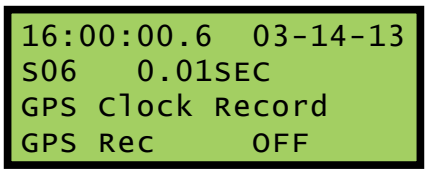
```
05:18:27.0  03/14/13  System Power          Power     OFF       S01
05:18:59.2  03/14/13  System Power          Power     ON        S01
14:11:51.0  03/14/13  High Temperature      HighTemp  ON        S02
15:00:09.0  03/14/13  High Temperature      HighTemp  OFF       S02
16:00:00.6  03/14/13  GPS Clock Record      GPS Rec   OFF       S06  0.01SEC
```

Sample System Event Records

The first two records indicate that power was off to the logger for approximately 32 seconds. Later in the same day the measured temperature was found to be excessive for 48 minutes. At 16:00:00.6 the GPS Receiver synchronized the logger's clock. It corrected the clock by .01 seconds.

With the Clock Sync Mode set to SNTP or GPS the user will never have to manually set the clock.

The GPS Receiver sync record listed previously is shown in the following as it would appear at the front panel LCD.



LCD System Event Record

System Events can be Queried and Browsed just like other Event Records. Instead of selecting a D, A, V or T input type designator, select the S-type.

System Events are always logged to memory in chronological sequence. The power on event will immediately follow the power off event. The time between the two Event Records indicates the period during which no logging was possible. All of the Analog Input measurements for S1 records will be reported with a zero value. This is done to eliminate erroneous readings.

UPDATING THE FIRMWARE

Like any microprocessor-based product, the VDL executes a stored memory program. The program, referred to as firmware, is saved in a Flash Memory chip. Flash Memory chips are uniquely characterized by their permanent storage and multiple write properties. Their use allows the VDL firmware to be updated to a newer version by simply uploading a new program file. The once common practice of shipping and replacing a Programmable Read Only Memory (PROM) chip does not apply to the VDL. Consequently, there is no need to open the unit to gain access to the Processor PCB.

The firmware update procedure, described in this section, must be performed via a PC connected to the Terminal Port, USB Device Port, Ethernet Port or internal modem (provided the latter two are installed). At the request of the user, MICRO-AIDE support personnel can perform the update via the modem. A firmware update can also be performed very easily by using the USB Host Port. The instructions for doing so are described in the section entitled "Update" on page 70.

Occasionally a new firmware release will be incompatible with the logger's existing Setup Database. When this happens the existing database will have to be erased and a new one created. Incompatibilities, if any, are listed in Table 2 on page 5. It should always be reviewed before proceeding with an update.

The steps necessary to complete the firmware update depend upon which communications application is being used. The following example describes the HyperTerminal method. HyperTerminal 7.0 was used in the following procedure. Other versions of this program may be slightly different. However, the fundamental approach will remain valid.

1. The user must be online with the logger and the Main Menu should be displayed. Refer to the sample data entitled "Main Menu" on page 15.
2. From the Main Menu select the Transfer Files command. The following sub-menu of commands will be displayed.

```
File Transfer

D Download Setup Data VDL to PC
U Upload Setup Data PC to VDL
F Firmware Upload
```

Transfer Files Command

3. Select the Firmware Upload command. The following warning will be displayed.

```
Are you SURE you want to upload new Firmware?
No Yes
```

4. To proceed select Yes. The following additional warning will be displayed.

```
OK to erase Firmware and upload new Firmware in Intel HEX format?
No Yes
```

5. To proceed select Yes. A final precaution will be displayed as follows.

```
Do you want to ABORT this operation
No Yes
```

6. To proceed select No. After a short delay the following message will be displayed.

```
Please send Intel HEX file now.
```

7. Within the HyperTerminal window, click on the Transfers command, then the Send Text File... command. The Send Text File dialog box will open.
8. In the drop down list box select All files (*.*) as the type of file to display.
9. Select the correct disk drive, folder and filename (e.g., VDL S7-300 V113.hex). If the various settings are correct click on the Open button.
10. The progress of the upload will be indicated by a sequence of period (.) characters.
11. The update will terminate automatically after a few minutes (at 38,400 Baud). The following message will indicate a successful file transfer.

```
Done!
Press ESC to continue
```

12. Press the **Esc** key as instructed. The following message will be displayed.

```
Do you want to restart the data logger now?
No Yes
```

13. Select Yes to initialize the new firmware. At the conclusion of the initialization the user will be asked to log on.

After completing the firmware update procedure it may be necessary to execute the Reset System command. A reset should be performed only if recommended by MICRO-AIDE customer service technicians. Refer to the section entitled "Reset System (R)" on page 18.

Trouble-Shooting Guide

The following guide is provided to assist the user in resolving problems that may occur with the operation of the VDL. It can be especially helpful when attempting to operate the logger for the first time. Procedures for resolving both local and remote problems are listed. Where multiple steps are indicated it is recommended that they be performed in the order listed. Corrective actions to be performed inside the VDL must be carried out in accordance with the procedure entitled "Working Inside the Data Logger" on page 73.

If the user is unable to resolve the problem, MICRO-AIDE customer service technicians should be contacted. The user will be asked to state the problem, related symptoms, and indicate any operations or conditions that have a bearing on the problem. If available, the results of any diagnostic tests should be reported. If the logger has an installed modem it may prove to be helpful in diagnosing the problem from the MICRO-AIDE factory. The user will be asked to provide the appropriate telephone number and correct password.

Symptom or Problem	Resolution
No indication of power.	Verify 9 to 36 Vdc at B and N power terminals. Inspect fuse on Processor PCB.
PC will not connect via USB Device Port.	Verify USB Type A-B cable is being used. Verify correct USB device driver is installed (refer to Appendix C).
PC does not display data when connected to the Terminal Port.	Check cable connection to Terminal Port. Verify cable is assembled per Figure 6 on page 87. Check Baud rate setting. Check if Terminal LED on front panel illuminates.
Terminal Port data at PC is garbled.	Check Baud rate setting. Verify following setting: 8 data bits, 1 start bit, 1 stop bit.
Highlight cannot be moved using PC arrow keys.	Set PC for ANSI emulation.
PC does not communicate via Ethernet Port when directly connected.	Verify logger's IP Address and Port Number are correctly assigned. Verify PC's Ethernet Port is configured properly. Verify PC's communications application is set up for TCP/IP protocol and Telnet. Verify CAT-5 cable is being used.
Setup Database transfer fails via Ethernet Port connection.	Use Network command to change TCP/IP mode setting to Telnet.
GPS Receiver fails to provide accurate clock control.	Verify GPS antenna is plugged in. Verify location of GPS antenna provides good skyward access. Verify Clock Sync Mode is set to GPS. Verify GPS Receiver diagnostic test reports Valid.
GPS Receiver diagnostic test reports Invalid time and/or 0.0000° coordinates.	Wait 60 minutes while GPS Receiver attempts to achieve signal lock with satellite(s). Relocate GPS antenna for improved reception.

Table 13: Guide to Trouble-Shooting Techniques

Symptom or Problem	Resolution
SNTP fails to provide accurate clock control.	Verify Clock Sync Mode is set to SNTP. Verify time server is transmitting SNTP-Multicast (or see next). Verify time server is transmitting SNTP-Unicast and SNTP Server address is valid.
Real-time clock is incorrect by one or more hours even with GPS Receiver or SNTP control.	Verify correct Daylight Saving Time and Time Zone settings.
Cannot save Event Record files to flash drive.	Verify the USB flash drive is formatted FAT-32, not NTFS. Verify flash drive is fully seated into USB Host Port. LED on flash drive should flash as files are being saved. Test integrity of flash drive by plugging it directly into a PC and copying files from the PC. Try another flash drive.
Unable to update firmware using USB Host Port.	Verify the USB flash drive is formatted FAT-32, not NTFS. Verify flash drive is fully seated into USB Host Port. Verify flash drive contains an unzipped firmware file. Verify firmware filename ends in .hex. Verify firmware filename does not include illegal characters. Verify length of firmware filename does not exceed 20 characters.
Event Records from some Digital Inputs are not being created.	Verify CP 340 is properly installed and operational. Verify VDL is properly cabled to S7-300. Use MICRO-AIDE provided cable depicted in Figure 6 on page 87.
Analog Input AC source measures 0.	Analog Input is configured for DC, change to AC.
Analog Input DC source measures correctly but reports AC units.	Analog Input is configured for AC, change to DC.
Negative Analog Input voltage is not reported, measures 0.	Analog Input Range is set to +51.1 Vdc, change to ±25.5 Vdc or ±255 Vdc setting.
AC analog readings are not stable.	Reassign the analog Filter setting to Slow.
DC analog readings are not tracking voltage changes.	Reassign the analog Filter setting to Fast.
Timer Input is not reporting an Event Record.	Verify valid inputs are assigned in the From and To fields. Verify the assigned inputs are each generating state changes.
Upload / Download of Setup Database fails.	Verify Xmodem protocol is being used.
Modem does not answer.	Check phone line connection. Verify Modem Ring Count is not set to zero.
Modem answers but fails to connect.	Verify host modem is enabled for error corrected operation. Check noise levels on phone lines. Test host modem with another auto-answer system.

Table 13: Guide to Trouble-Shooting Techniques

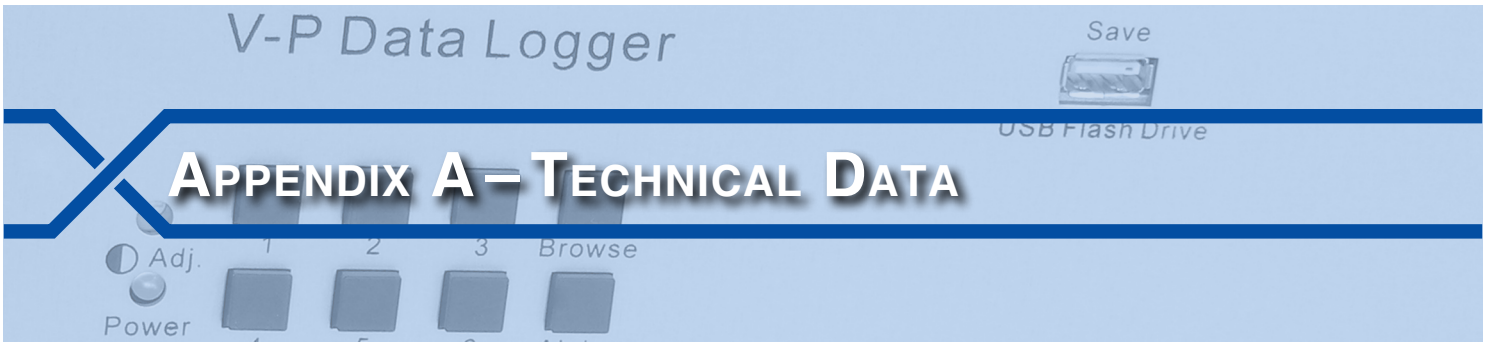
Symptom or Problem	Resolution
Modem will not dial out alarms.	Test phone line for dial tone. Perform Modem Test command. Verify modem is enabled by Virtual Input settings for dial out. Check Primary and Secondary Dial Numbers.
Internal relay will not operate.	Perform Relay Test command. Verify relay is enabled by Virtual Input. Disconnect the external circuit attached to the relay contacts, test again.
Visibility of LCD characters is poor.	Adjust LCD contrast.
Setup Database is incorrect after upgrading to V1.10 or later.	Create new Setup Database, it is incompatible with V1.10 and later. Contact MICRO-AIDE to have old Setup Database converted.

Table 13: Guide to Trouble-Shooting Techniques

This completes the User Manual for the VDL S7-300. As an aid to the user three appendices have been provided. They include detailed specifications and options applicable to the VDL. Instructions on how to install the Windows drivers that support the USB Device Port feature are included in Appendix C.

Any comments the reader may have on how to improve this manual are welcomed. Comments should be forwarded to the Director of Marketing, MICRO-AIDE Corporation.

6



APPENDIX A – TECHNICAL DATA

SPECIFICATIONS

Physical
Size (without mounting brackets)
Length: 9.5"
Height: 7.2"
Depth: 3.4"
Weight
2.5 lb.

Environmental
Storage
Temperature: -50 °C to 85 °C
Humidity: 0 to 95 %, non-condensing
Operating
Temperature: -40 °C to 72 °C
Humidity: 0 to 95 %, non-condensing

Mounting
Shelf or backboard (includes mounting brackets)

Construction
Chassis
Fully enclosed, anodized aluminum
Externally accessible keypad, LEDs and connectors
Electrical
All components mounted on conformal coated, internal PCBs

Power
Voltage
Range: 9 to 36 Vdc
Consumption
Typical: 2 W
Maximum: 4 W (with GPS Receiver, Ethernet and Modem options)

Isolation
Power
Minimum: 3800 Vdc from B and N terminals to chassis and inputs
Analog Inputs
Minimum: 3800 Vdc to any terminal
Input to Adjacent Input
Analog: minimum 3200 Vdc
USB Host and Device Ports
Minimum: 3800 Vdc to any terminal
GPS Receiver and Ethernet Port (optional)
Minimum: 3800 Vdc to any terminal
Internal Modem (optional)
Designed to meet FCC part 68 standards

Capacities
Inputs
Digital: 999, as available from Siemens S7-300
Analog: 4 total, voltage or current (optional)
Virtual: 8, user assigned
Timer: 16, user assigned
Outputs
Relay: 1, form C, rated for 2 A at 24 Vdc or 1 A at 125 Vac, maximum switching capacity of 125 VA or 60 W, service life 1 million electrical (typical)
Event Storage
Standard: 284,785 records
Maximum: 1,182,769 records
Liquid Crystal Display
Characters: 80 total on 4 lines
Viewing Area: 2.8" by .8"
Front Panel Keypad
Quantity: 20 keys

Inputs
Input Impedance
Analog: minimum 10 MOhms
Range
Analog DC Voltage: 3 scales, ±25.5, +51.1, ±255
Analog AC Voltage: 2 scales, 25.5, 255
Event Validation Times
Digital: not applicable, Siemens S7-300 transmits 999 bit states 3 times per second using 3964R protocol
Analog: fast and slow filter settings

Analog Limit Values
Voltage
High and Low Limits: in multiples of .1 V or 1 V
Current
High and Low Limits: in multiples of .1 A

Analog Input Accuracy
Typical Vdc: ±1 % full scale
Typical Vac: ±1.5 % full scale
Typical Current: ±2 % full scale

Virtual Inputs
Definitions
Any logical association shared by 1 to 4 variables (i.e., Digital, Analog, Timer or other Virtual Inputs)
Assigned by defining the state of the Virtual Input for each combination of variable states
Reporting
Creates standard Event Records
Relay can be controlled by each Virtual Input
Modem (optional) can be enabled to dial out Event Records

Timer Inputs
Programming
Any input can be assigned as a trigger or terminating source
On or Off events can be assigned as a trigger or terminating source
Limit Values
High and Low Limits: in multiples of .1 seconds
Range: 0.0 to 999.9 seconds
Reporting
Measured Time is reported in each Timer Input Event Record
Violation of Limit Values are also reported

Temperature Sensing
Usage: measures and reports internal temperature of logger
High and Low Limits: -67 °F to 257 °F

Memory
Type
Non-volatile, Event Records and Setup Database are stored in flash memory chip
Newest data over-writes oldest data, 129th day over-writes first day
Storage Longevity
Infinite with power off
Rated for 100,000 write operations

Ports
RS-232
Quantity: 1, for use with a PC
Terminal Emulation: ANSI
Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, 115,200
Bit Format: 8-N-1
Vital-Processor Port
Quantity: 1, connects to CP 340 of Siemens S7-300
Bit Messaging: Siemens S7-300 transmits 999 bit states 3 times per second
Protocol: Siemens 3964R
Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, 115,200
Default Rate: 9600
Bit Format: 8-N-1
USB Host
Compatible with any FAT-32 formatted flash drive
Can create a text file of Event Record data from any time span
Can be used to update firmware
USB Device
Eliminates need for serial comm port, data transfer rates of 960 Kbps

Ports (continued)

Ethernet (optional)

Type: 10/100 Base-T

Protocols: TCP/IP, Telnet, SNTP-Multicast and -Unicast

Concurrent Sessions: Telnet (2)

Provides remote or local access via TCP/IP

Data transfer rates of 850 Kbps

User assignable IP Address, Telnet port, sub-net mask, Unicast IP Address

Modem (optional)

Provides remote access, auto-answer

GPS Receiver (optional)

Used to provide precise, real-time clock control, latitude and longitude coordinates

Connectors

Power

Detachable, tension clamp, 4-position, 12 to 22 AWG

Dual B and N terminals

Analog Inputs

Detachable, tension clamp, 8-position, 12 to 22 AWG

Relay

Detachable, tension clamp, 3-position, 12 to 22 AWG

Normally open, normally closed and common terminals per relay

Terminal Port

DE-9 male, configured as modified DCE

Vital-Processor Port

DE-9 male, configured as modified DCE

USB Host Port

USB Type A female

USB Device Port

USB Type B female

Telephone Line

RJ-11 female

Ethernet Port (optional)

RJ-45 female

GPS Receiver (optional)

MCX female

Indicators

LCD Panel

Includes LED back lighting for enhanced visibility

Displays numerous command menus for configuring the Data Logger and retrieving data

Front Panel LEDs (3)

Power: green

Terminal: green, flashes with send and receive data

Modem: green, flashes with send and receive data and ringing

Ethernet Port LEDs (2 optional)

Green: link established

Yellow: data activity

Controls

Keypad

Located on front panel, below LCD

Keys: 0-9, Browse, Alpha, Setup, Esc, Enter, Save/., left, right, up, down/-

LCD Contrast Adjust

Single-turn pot., accessible from front panel

Internal Clock

Accuracy

Typical: ±8 seconds per month (3 ppm) when not synchronized

Volatility: maintains accuracy for minimum of 30 days with loss of power

Resolution: .1 seconds for all Event Records

Siemens S7-300 transmits 999 bit states 3 times per second

Sync Interval

SNTP-Unicast: via time server, 5 minutes after each hour (requires Ethernet Port option)

SNTP-Multicast: per time server schedule (requires Ethernet Port option)

GPS: once per hour (requires GPS Receiver option)

Operation

Time Zones: selectable from 7 different North American settings

Daylight Saving Time: enable or disable automatic adjustment

Leap Year: automatically adjusted

GPS Receiver (optional)

Includes PCB and external antenna

PCB

Plugs into mating connector inside Data Logger

Antenna

Size: Diameter 1.8", Height .6" (not including mounting screw)

Weight: 2 oz. (less cable)

Operating Temperature: -40° C to 85 °C

Mounting: bulkhead mountable to any surface less than 3/8" thick

Location: unobstructed skyward orientation, for use outdoors

Password Protection

Administrative Level

Access: unrestricted to all functions

Length: 8 characters

Restricted Level

Access: Event Record and Setup Database viewing only

Length: 8 characters

Passcode

Access: limited modifications to Setup Database via front panel

Length: 8 digits

Internal Modem (optional)

Type

V.34, 33,600 Baud, data compression and error correction

Usage

Remote access via auto-answer operation

Allows dial-out alarm reporting of Virtual Input records

Compliance

Designed to meet FCC part 68 standards

Dial-out Alarms (optional)

Calling Method

Primary and secondary dial numbers, multiple attempts

Tone or pulse dialing

Data

Issues Virtual Input Event Records if enabled by Virtual Input definition

MICRO-AIDE reserves the right to make changes, at its sole discretion, to any specification listed herein.

TRANSFER RATES

The following table lists typical bit transfer rates for each of the VDL's user-accessible ports. In each case the same 20,000 Event Records with no-detail formatting were either dumped to a PC file or saved directly to a flash drive. The times listed are normalized relative to 1,000 Event Records. If speed is a concern, using the USB Device Port is highly recommended.

Port	Time to transfer 1,000 Event Records (sec)	Actual transfer rate (bps)	Relative speed compared to 38,400
Terminal Port (38,400)	18.78	38,352	Used as reference
Internal modem	14.48	50,638	1.3 times faster
Terminal Port (115,200)	6.28	114,569	3.0 times faster
USB Host	5.83	123,607	3.2 times faster
Ethernet Port	.84	853,851	22.3 times faster
USB Device Port	.75	960,103	25.0 times faster

Table 14: Bit Transfer Rates by Port

TERMINAL PORT CABLE

Two of the following cable are included with every VDL S7-300. It is used to connect a PC to the VDL's Terminal Port. It is also used to connect the VDL to the CP 340 Communications Processor of the S7-300.

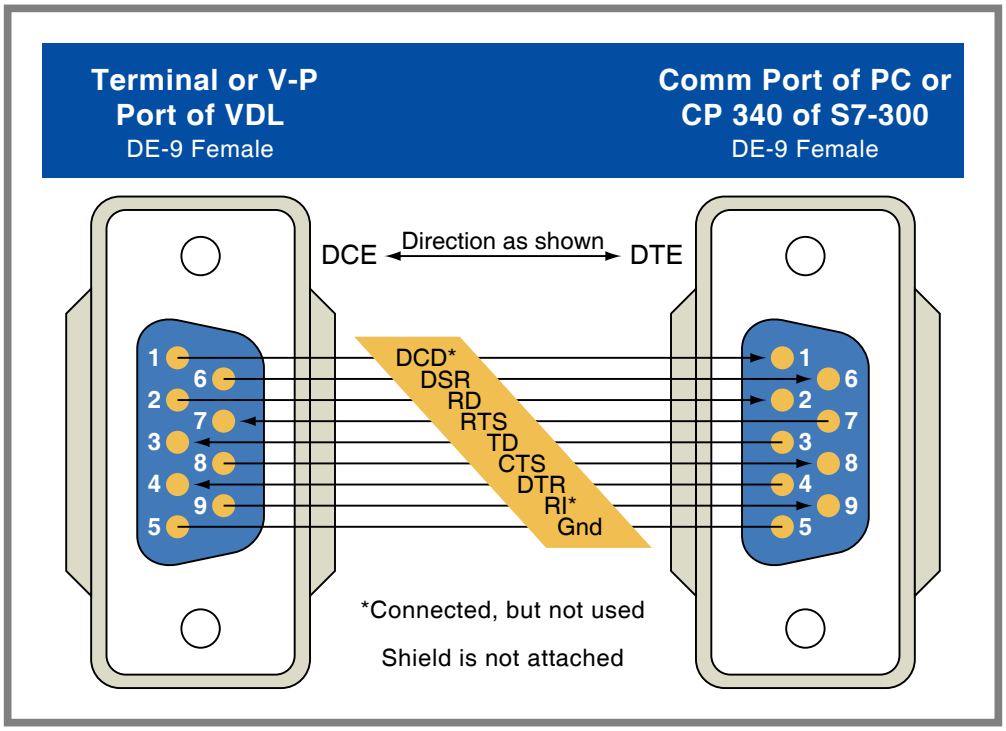


Figure 6: Terminal Port Cable - Wiring Diagram

A

User Notes

Appendix B – Options and Accessories

Options

GPS Receiver Module

85-0135
Provides precise, non-drift control of logger's real-time clock, includes bulkhead-mount antenna with 16' of cable

L 56237-5/00
Replaces bulkhead-mount antenna with magnetic-mount antenna

Ethernet Port

85-0136
10/100 Base-T, 100 Mbps; TCP/IP, Telnet and SNTP-Multicast compatible

Internal Modem

85-0145
33,600 Baud, V.34, V.32bis, V.32, V.22bis, V.22 and V.21
V.42bis and MNP 5 data compression
MNP 2-4 and LAP-M error correction

Memory Expansion

40-0416
584,113 Event Records

40-0816
1,182,769 Event Records

Accessories

Mounting

31-0001
19" rack mounting brackets

31-0002
23" rack mounting brackets

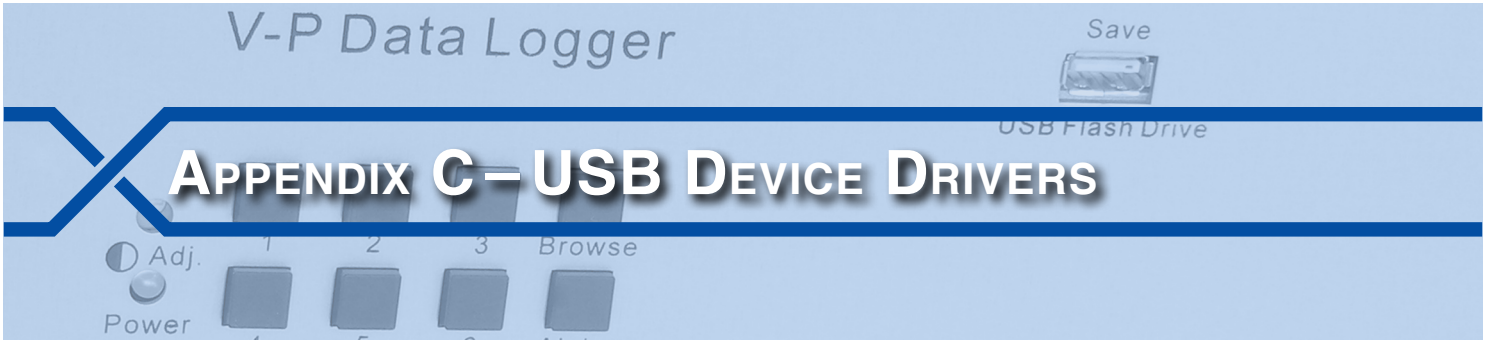
Cables

DE-9 to DE-9 (2, included)
USB A-B cable (for use with USB Device Port)

B

Contact MICRO-AIDE when ordering any options or accessories
Purchase orders should list part numbers as listed above

User Notes



APPENDIX C– USB DEVICE DRIVERS

INTRODUCTION

Every VDL is equipped with a USB Device Port. The device port can be used to directly connect the Data Logger to a PC that does not include a serial comm port. The port also provides a substantially higher speed connection. Bit transfer rates of 960Kbps can be achieved. Table 14 on page 87 lists the bit transfer rates of each user-accessible port.

This appendix provides a detailed description of how to select and install the proper drivers for the USB Device Port. Separate procedures for Windows XP® and Windows 7 are listed in the sections that follow.

The following procedure requires access to several files. The correct files are included in the CD that accompanies this User Manual. The CD can be found inside the back cover. The files are also available for downloading from the MICRO-AIDE website at:
http://micro-aide.com/support/downloads.htm

Do not attempt to install driver files from any source other than the enclosed CD or MICRO-AIDE website.

PREPARATION

The following pre-installation steps must be completed before the driver installation procedure can be started.

- Locate the CD that is inserted inside the back cover of this User Manual. Alternatively, download the file named "usb_device_drivers.zip" from the MICRO-AIDE website. Unzip the downloaded file. The extracted files must then be saved to a known location (e.g., to a new folder located at the PC desktop).
- A USB Type A-B cable is required.
- Apply power to the logger and insure that it has completed its initialization cycle.

INSTALLING THE DRIVERS

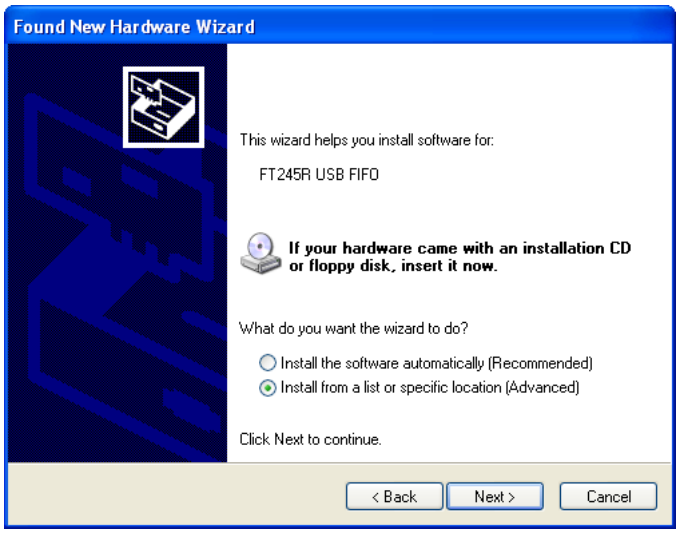
WINDOWS XP PROCEDURE

To install the proper USB Device Port drivers, complete the following steps in the order listed.

1. Connect the USB Type A-B cable to the logger's USB Device Port and an available USB port at the PC.
2. After a brief delay the first of several Found New Hardware Wizard screens will be displayed. Enable the radio button labeled "No, not this time". This will prevent Windows from attempting to access the drivers via the Internet. The correct setting is shown in the following. Click the button labeled "Next>".

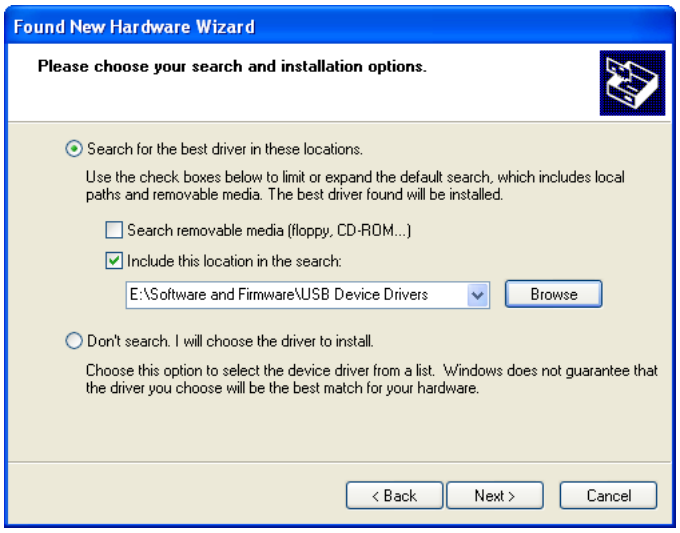
Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

3. The second screen of the Found New Hardware Wizard shown in the following will be displayed. Enable the radio button labeled “Install from a list or specific location (Advanced)”. The correct setting is shown in the following. Click the button labeled “Next>”.


Found New Hardware Wizard
This wizard helps you install software for:
FT245R USB FIFO
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

4. Insert the CD that is included with this User Manual into an available CD drive. Ignore this step if the software was downloaded from the MICRO-AIDE website.

5. The third screen of the Found New Hardware Wizard shown in the following will be displayed. Enable the radio button labeled “Search for the best driver in these locations”. Clear the check box labeled “Search removable media (floppy, CD-ROM...)”. Check the check box labeled “Include this location in the search:”.


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
E:\Software and Firmware\USB Device Drivers
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

6. Click the button labeled "Browse" to open the dialog box named "Browse For Folder". Navigate to the CD folder named "Software and Firmware\USB Device Drivers". Alternatively, navigate to the location where the previously downloaded software was saved. Click the button labeled "OK" to accept the specified folder location and close the dialog box. Verify the settings as shown in the preceding screen. Click the button labeled "Next>".

7. After a brief delay while the driver is being copied and installed, the fourth screen of the Found New Hardware Wizard shown in the following will be displayed. Click the button labeled "Finish" to complete the installation of the first of two drivers.

C

8. After a brief delay the first Found New Hardware Wizard screen will reappear. The second driver can now be installed. It is installed by repeating steps 2 through 7 as listed previously. The screens and required settings will be identical.

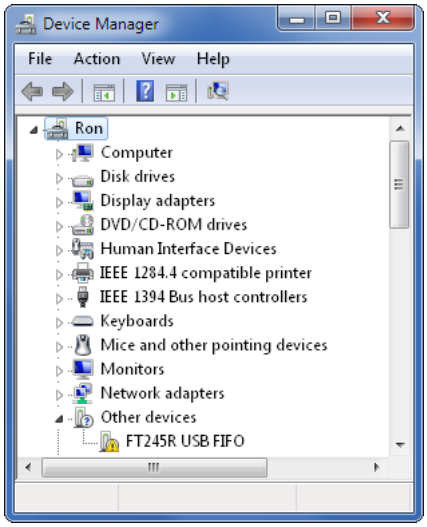
9. Disconnect the USB cable immediately after the button labeled "Finish" is clicked. Restart the PC as instructed. Restarting Windows is a common practice after new software is installed. A new HyperTerminal connection can now be created. Follow the procedure entitled "Making a USB Device Port Connection" on page 96.

WINDOWS 7 PROCEDURE

Windows 7 was used in preparing the following procedure. However, the steps listed are generally applicable to any procedure involving the Device Manager. It can be consulted anytime Windows fails to automatically install a set of drivers and the user has access to the correct driver software. Complete the following steps in the order listed.

1. Connect the USB Type A-B cable to the logger's USB Device Port and an available USB port at the PC. After a brief delay Windows will indicate that it has failed to install the correct drivers.

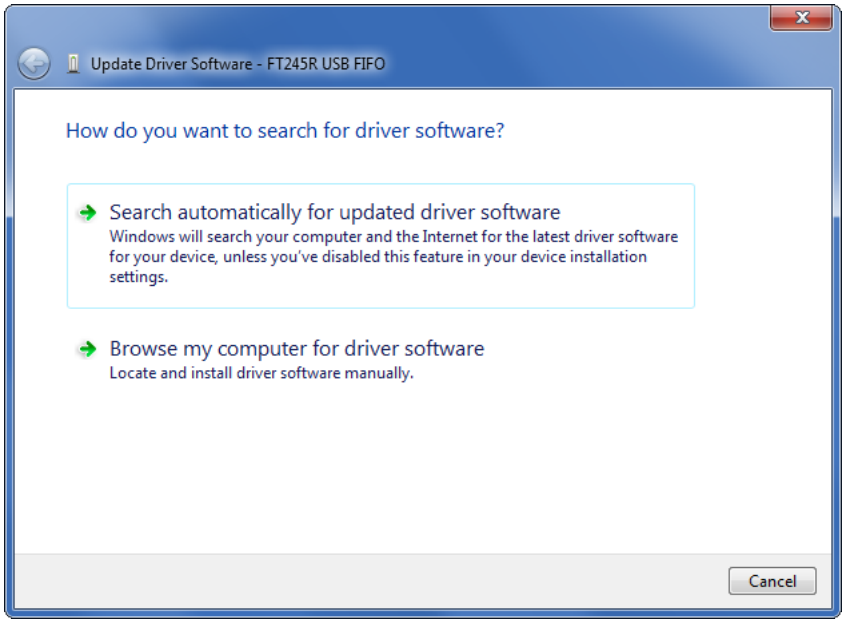
2. Launch Device Manager. A screen similar to the following will be displayed.



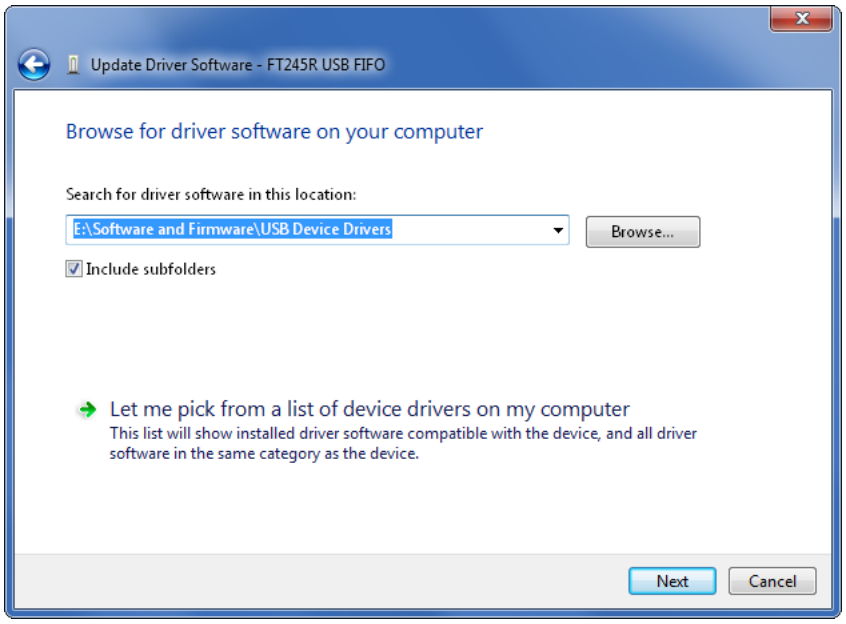
C

Device Manager can be accessed from the Control Panel or by right-clicking on the Computer icon located at the Desktop and then selecting Properties. A link to Device Manager will be listed.

3. Right-click on the link labeled "FT245R USB FIFO". From the context menu click the command labeled "Update Driver Software...". The following screen will be displayed.

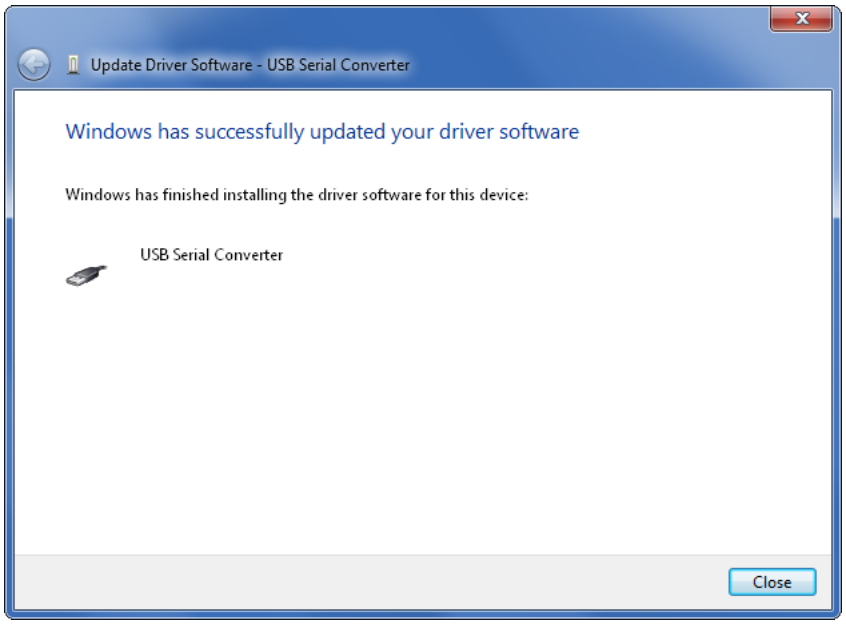

Update Driver Software - FT245R USB FIFO
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

4. Click the second option labeled "Browse my computer for driver software". The following screen will be displayed.


Update Driver Software - FT245R USB FIFO
Browse for driver software on your computer
Search for driver software in this location:
E:\Software and Firmware\USB Device Drivers
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel

5. Click the button labeled "Browse..." to open the dialog box named "Browse For Folder". Navigate to the CD folder named "Software and Firmware\USB Device Drivers". Alternatively, navigate to the location where the previously downloaded software was saved. Click the button labeled "OK" to accept the specified folder location and close the dialog box. Enable Windows to search through subfolders by enabling the appropriate check box. Click the button labeled "Next>".

6. After several seconds Windows will complete the installation of the driver software. The following screen will be displayed.


Update Driver Software - USB Serial Converter
Windows has successfully updated your driver software
Windows has finished installing the driver software for this device:
USB Serial Converter
Close

7. Click the button labeled "Close" to complete the installation of the first of two drivers.

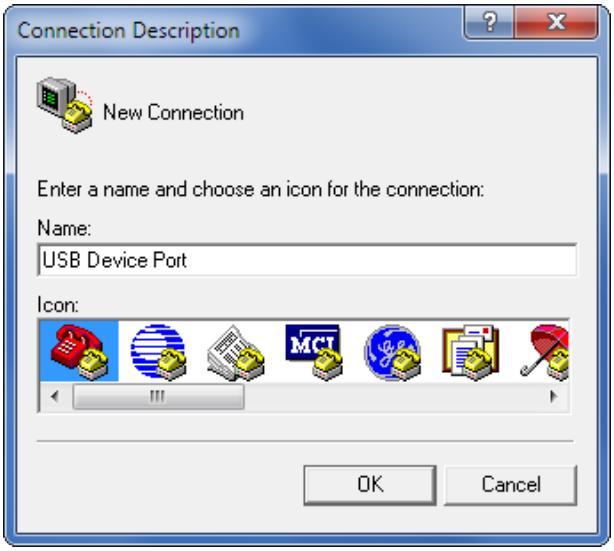
8. The second driver can now be installed. It is installed by repeating steps 2 through 7 as listed previously. The screens and required settings will be identical.

9. Disconnect the USB cable immediately after the button labeled "Close" is clicked. Restart the PC as instructed. Restarting Windows is a common practice after new software is installed. A new HyperTerminal connection can now be created as described in the next section.

MAKING A USB DEVICE PORT CONNECTION

After the PC has restarted per the preceding instructions, the user should test the USB device connection by performing the following steps. This procedure applies to both Windows XP and Windows 7.

1. Connect the USB Type A-B cable to the logger's USB Device Port and an available USB port at the PC.
2. Launch HyperTerminal. A dialog box named "Connection Description" will be displayed. Assign the new connection a descriptive name like "USB Device Port" as shown in the following. Click the button labeled "OK".



3. A dialog box named "Connect To" will be displayed. Click the down arrow to the right of the drop down list box named "Connect using:". Select the virtual comm port that was recently created (e.g., COM15). Click the button labeled "OK".

4. A dialog box labeled "COM15 Properties" will be displayed. The reference to COM15 will be replaced by the port number selected in step 3. Close the dialog box by clicking the button labeled "Cancel".

The COM15 Properties dialog box referenced in the previous step can be ignored. Baud rate and bit format settings do not apply to USB connections of this type.

C

5. A blank HyperTerminal Window will be displayed. In the lower left-hand corner of the screen, the word Connected should appear.

6. Verify that the connection is active by pressing the **Enter** key at the PC keyboard. The password challenge will be displayed. The user is now able to access the logger in accordance with the password that is entered. Refer to the section entitled "Administrative and Restricted Passwords" on page 21 for details regarding the use of passwords.

7. Finally, save the new connection. Within the HyperTerminal window, click on the File command, then the Save As... command. The Save As dialog box will open. Save the new connection to a convenient location such as the desktop. For the example cited herein, the new connection will appear as a new desktop icon labeled "USB Device Port.ht".

Once the proper drivers are installed, the USB Device Port of each VDL will appear as a new virtual comm port on the PC. In accordance with the example cited herein, the next VDL that is connected will likely want to use COM16. To accommodate the new logger simply select COM16 in step 3. The new connection can be saved as well by repeating step 7.

User Notes

Material Return

In the event the customer identifies a malfunction in any product, call or write MICRO-AIDE and obtain a Return Material Authorization (RMA) number from the customer service department. Return the product to MICRO-AIDE, freight prepaid, with a note (in-warranty repair) or a purchase order (out-of-warranty) for the repair listing the following information:

- RMA number issued by MICRO-AIDE
- Return shipment address
- Name and e-mail address or telephone number of person familiar with the problem
- Brief description of the problem (include any printouts that may have a bearing on the problem)
- Method of payment for repair costs (out-of-warranty)
- Send product to the following address:

Micro-Aide Corporation
685 Arrow Grand Circle
Covina, CA 91722
Tel: 626-915-5502 Fax: 626-331-9484
E-mail: support@micro-aide.com

Limited Warranty

MICRO-AIDE warrants its products to be free from defects in material and workmanship for a period of five (5) years from the date of shipment. This warranty is in lieu of any other warranty, expressed or implied. In no event shall MICRO-AIDE be held liable for incidental or consequential damage resulting from (1) the use of any of its products, or (2) any alleged breach of this warranty provision. MICRO-AIDE's liability shall be limited to repairing or replacing, at its sole discretion, any defective product which is returned in accordance with the MICRO-AIDE Material Return Policy.

Product that has been subjected to abuse, misuse, alteration, accident, lightning damage, neglect or unauthorized installation or repair shall not be covered by this warranty. MICRO-AIDE reserves the right to make a final decision as to the existence of any failures and the cause of such failures. No warranty is made with respect to custom equipment or products produced to buyer's specifications except as mutually agreed upon in writing.

MICRO-AIDE CORPORATION
685 Arrow Grand Circle
Covina, CA 91722
Tel: 626-915-5502 Fax: 626-331-9484
E-mail: support@micro-aide.com